CCGPS Frameworks Student Edition

Mathematics

Third Grade Unit Five
Geometry

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"Making Education Work for All Georgians"

Unit 5: GEOMETRY

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Culminating Task

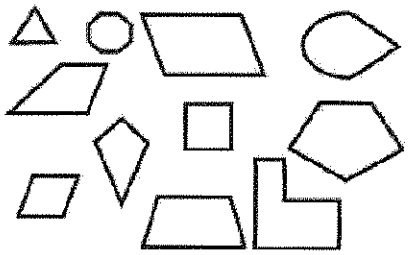
OVERVIEW

In this unit students will:

- Further develop understandings of geometric figures by focusing on identification and descriptions of plane figures based on geometric properties.
- Identifies examples and non-examples of plane figures and solid figures based on geometric properties.
- Identify differences among quadrilaterals.
- Understand that shapes in different categories may share attributes and those attributes can define a larger category (example: rhombuses, rectangles, and others have four sides and are all called quadrilaterals).
- Expand the ability to see geometry in the real world.
- Can draw plane figure shapes based on attributes.
- Further develop understanding of partitioning shapes into parts with equal areas.
- Partitions shapes in several different ways into equal parts of halves, thirds, fourths, sixths, and eighths and recognizes the partitioned parts have the same area.
- Use data collected to make bar and picture graphs.
- Interpret line plots.

Third Grade students will describe, analyze, and compare properties of two-dimensional shapes. They compare and classify shapes by their sides and angles, and connect these with definitions of shapes. Students also relate their fraction work to geometry by expressing the area of part of a shape as a unit fraction of the whole. Mathematically proficient students communicate precisely by engaging in discussion about their reasoning using appropriate mathematical language.

In second grade, students identify and draw triangles, quadrilaterals, pentagons, and hexagons. Third graders build on this experience and further investigate quadrilaterals (technology may be used during this exploration). Students recognize shapes that are and are not quadrilaterals by examining the properties of the geometric figures. They conceptualize that a quadrilateral must be a closed figure with four straight sides and begin to notice characteristics of the angles and the relationship between opposite sides. Students should be encouraged to provide details and use proper vocabulary when describing the properties of quadrilaterals. They sort geometric figures (see examples below) and identify squares, rectangles, and rhombuses as quadrilaterals.



Students should classify shapes by attributes and by drawing shapes that fit specific categories. For example, parallelograms include: squares, rectangles, rhombi, or other shapes that have two pairs of parallel sides. Also, the broad category, quadrilaterals, includes all types of parallelograms, trapezoids and other four-sided figures.

Students should also use this standard to help build on their understanding of fractions and area. Students are responsible for partitioning shapes into halves, thirds, fourths, sixths and eighths. Given a shape, students partition it into equal parts, recognizing that these parts all have the same area. They identify the fractional name of each part and are able to partition a shape into parts with equal areas in several different ways.

As an ongoing process throughout all third grade units, students should continue to develop understanding of representing and interpreting data using picture and bar graphs. They should also continue their work in generating measurement data by measuring lengths with rulers marked with halves and fourths of an inch. In second grade, students measured length in whole units using both metric and U.S. customary systems. It is important to review with students how to read and use a standard ruler including details about half and quarter marks on the ruler. Students should connect their understanding of fractions to measuring to one-half and one-quarter inch. Third graders need many opportunities measuring the length of various objects in their environment. This standard provides a context for students to work with fractions by measuring objects to a quarter of an inch.

With geometry, many student misconceptions might occur. The four content goals for geometry include shapes and properties, transformation, location, and visualization (see Van de Walle, page 205.) Students often have a difficult time recognizing shapes if the shape has been transformed by a translation, reflection, or rotation. Students may also identify a square as a "non-rectangle" or a "non-rhombus" based on limited images they see. They do not recognize that a square is a rectangle because it has all of the properties of a rectangle. They may list properties of each shape separately, but not see the interrelationships between the shapes. For example, students do not look at the properties of a square that are characteristic of other figures as well. Using straws to make four congruent figures have students change the angles to see the relationships between a rhombus and a square. As students develop definitions for these shapes, relationships between the properties will be understood.

http://www.learner.org/courses/learningmath/geometry/session10/index35.html - Lesson for the teacher to learn more about teaching Geometry to elementary students. The lesson includes ideas for lessons, video of classrooms, etc.

STANDARDS FOR MATHEMATICAL CONTENT

Mathematical standards are interwoven and should be addressed throughout the year in as many different units and activities as possible in order to emphasize the natural connections that exist among mathematical topics.

Reason with shapes and their attributes.

MCC3.G.1 Understand that shapes in different categories (e.g., rhombuses, rectangles, and others) may share attributes (e.g., having four sides), and that the shared attributes can define a larger category (e.g., quadrilaterals). Recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories.

MCC3.G.2 Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole. *For example, partition a shape into 4 parts with equal area, and describe the area of each part as 1/4 of the area of the shape.*

Represent and Interpret Data

MCC3.MD.3 Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs. *For example, draw a bar graph in which each square in the bar graph might represent 5 pets.*

MCC3.MD.4. Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units— whole numbers, halves, or quarters.

STANDARDS FOR MATHEMATICAL PRACTICE

Students are expected to:
1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

*****Mathematical Practices 1 and 6 should be evident in EVERY lesson*****

ENDURING UNDERSTANDINGS

- Identify and describe properties of two-dimensional shapes using properties that are shared between the shapes.
- Generalize that shapes fit into a particular classification.
- Compare and classify shapes by their sides and angles, and connect these with definitions of shapes.
- Geometric figures can be classified according to their properties.
- Quadrilaterals can be classified according to the lengths of their sides.
- Recognize shapes that are and are not quadrilaterals by examining the properties of the geometric figures.
- Conceptualize that a quadrilateral must be a closed figure with four straight sides and begin to notice characteristics of the angles and the relationship between opposite sides
- Provided details and use proper vocabulary when describing the properties of quadrilaterals.
- Sort geometric figures and identify squares, rectangles, and rhombuses as quadrilaterals.
- Classify shapes by attributes and by drawing shapes that fit specific categories. (e.g.; parallelograms include: squares, rectangles, rhombi, or other shapes that have two pairs of parallel sides.
- The broad category "Quadrilaterals" includes all types of parallelograms, trapezoids and other four-sided figures.

- Relate fraction work to geometry by expressing the area of a shape as a unit fraction of the whole.
- Shapes can be partitioned with equal areas in a variety of ways to show halves, thirds, fourths, sixths, and eighths.

ESSENTIAL QUESTIONS

- Can a shape be represented in more than one way? How and why?
- How are quadrilaterals alike and different?
- How are solid figures different from plane figures?
- How can angle and side measures help us to create and classify quadrilaterals?
- How can I use attributes to compare and contrast shapes?
- How can partitioning a shape into halves, thirds, fourths, sixths, or eighths in a variety of ways help me further develop my understanding of fractions?
- How can plane figures be combined to create new figures?
- How can shapes be combined to create new shapes?
- How can solid figures be categorized and classified?
- How can we communicate our thinking about mathematical vocabulary?
- How can you create different types of quadrilaterals?
- How does combing figures affect the attributes of those figures?
- What are the properties of quadrilaterals?
- What is a quadrilateral?
- What properties do solid figures have in common?
- Why are units important in measurement?
- Why is it important to partition shapes into equal areas?

CONCEPTS/SKILLS TO MAINTAIN

It is expected that students will have prior knowledge/experience related to the concepts and skills identified below. It may be necessary to pre-assess in order to determine if time needs to be spent on conceptual activities that help students develop a deeper understanding of these ideas.

- Represent and solve problems involving multiplication and division
- Understand properties of multiplication and the relationship between multiplication and division
- Multiply and divide within 100
- Solve problems involving the four operations, and identify and explain patterns in arithmetic
- Use place value
- Recognize basic geometric figures and spatial relationships of triangle, quadrilateral (squares, rectangles, and trapezoids), pentagon, hexagon, cube, trapezoid, half/quarter circle, circle, cone, cylinder, sphere

SELECTED TERMS AND SYMBOLS

The following terms are often misunderstood. These concepts are not an inclusive list and should not be taught in isolation. However, due to evidence of frequent difficulty and misunderstanding associated with these concepts, instructors should pay particular attention to them and how their

students are able to explain and apply them. These terms are **for teacher reference only** and are not to be memorized by the students. Teachers should present these concepts to students with models and real life examples. Students should understand the concepts involved and be able to recognize and/or demonstrate them with words, models, pictures, or numbers.

- 2-dimensional
- 3-dimensional
- acute angle
- attributes
- closed figure
- congruent
- cubes, cones, cylinders and rectangular prisms (as subcategories of 3-dimensional figures)
- polygon
- line plot
- obtuse angle
- open figure
- parallel
- parallelogram
- partition
- polygon
- properties
- quadrilateral
- rectangle
- rhombi, rectangles, and squares (as subcategories of quadrilaterals)
- rhombus/rhombi
- right angle
- square
- three-sided
- unit fraction

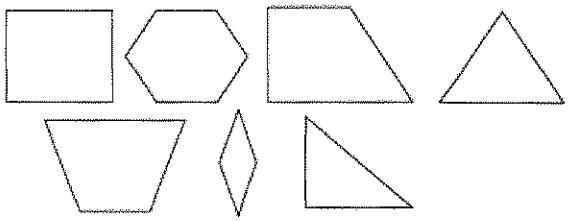
Additional resources for finding definitions for common geometry terms:
http://www.amathsdictionaryforkids.com/dictionary.html
http://www.mathleague.com/help/geometry/polygons.htm

STRATEGIES FOR TEACHING AND LEARNING:

In earlier grades, students have experiences with informal reasoning about particular shapes through sorting and classifying using their geometric attributes. Students have built and drawn shapes given the number of faces, number of angles and number of sides.

The focus now is on identifying and describing properties of two-dimensional shapes in more precise ways using properties that are shared rather than the appearances of individual shapes. These properties allow for generalizations of all shapes that fit a particular classification. Development in focusing on the identification and description of shapes' properties should include examples and non-examples, as well as examples and non-examples drawn by students of shapes in

a particular category. For example, students could start with identifying shapes with right angles. An explanation as to why the remaining shapes do not fit this category should be discussed. Students should determine common characteristics of the remaining shapes.



In Grade 2, students partitioned rectangles into two, three or four equal shares, recognizing that the equal shares need not have the same shape. They described the shares using words such as, halves, thirds, half of, a third of, etc., and described the whole as two halves, three thirds or four fourths. In Grade 3 students will partition shapes into parts with equal areas (the spaces in the whole of the shape). These equal areas need to be expressed as unit fractions of the whole shape, i.e., describe each part of a shape partitioned into four parts as ¼ of the area of the shape.

Have students draw different shapes and see how many ways they can partition the shapes into parts with equal areas.

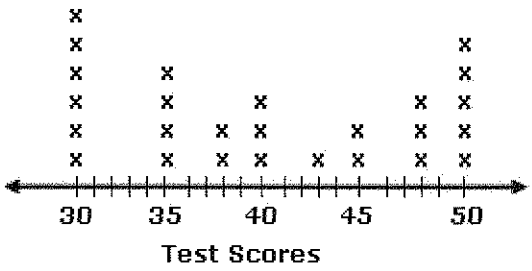
http://www.learner.org/courses/learningmath/geometry/pdfs/session9/vand.pdf - Geometric Thinking from John Van de Walle

Developing Geometric Thinking Through Activities that Begin With Play – By Pierre van Hiele http://print.nycenet.edu/NR/rdonlyres/0EFD73D4-340A-42E2-8EB4-3BC2A6B05603/38319/30vanHielePlay.pdf –

Also in the unit, students will use what they have learned in second grade about representing the length of several objects by making a line plot. In second grade, students would have rounded their lengths to the nearest whole unit. A line plot shows data on a number line with an **X** or other mark to show frequency.

Examples of Line Plot

- The line plot below shows the test scores of 26 students.



The count of cross marks above each score represents the number of students who obtained the respective score. For students in second and third grade, they will use the data from measuring with rulers to create line plots.

EVIDENCE OF LEARNING

By the conclusion of this unit, students should be able to demonstrate the following competencies:

- Identify and draw triangles, quadrilaterals (square, rectangle, parallelogram, trapezoid, and rhombus), pentagons, and hexagons.
- Draw common polygons.
- Sort, compare and classify geometric figures according to their properties.
- Identify and describe examples and non-examples of shapes based on properties.
- Partition shapes into equal shares of halves, thirds, fourths, sixths, and eighths.
- Use tangrams to combine (compose) shapes to make other shapes.
- Reason with shapes and their attributes.
- Create a bar graph and picture graph with a scale of 2, 5, or 10 based on a geometric picture
- Use a ruler to measure the sides of several shapes and create a line plot with the data.

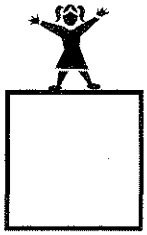
TASKS

Scaffolding Task	Constructing Task	Practice Task	Performance Tasks
Tasks that build up to the constructing task.	Constructing understanding through deep/rich contextualized problem solving tasks	Games/activities	Summative assessment for the unit.

Task Name	Type of Task/ *Grouping Strategy*	Skills
Show What You Know	**Scaffolding/** *Individual*	Describing, Drawing Shapes
Shape Sorter	**Scaffolding/** *Group/Partner*	Comparing/Contrasting, Classifying Shapes
What Makes A Shape?	**Constructing/** *Group/Partner*	Sorting and Classifying Shapes
Properties of Quadrilaterals	**Constructing/** *Group/Partner*	Defining Quadrilaterals
Can You Find It?	**Practice/** *Individual/Partner*	Identifying Shape
Score It!	**Practice/** *Individual/Partner*	Identifying Shapes Within Other Shape
Geoboard Geometry Guru	**Constructing/** *Group/Individual*	Defining Shapes
Tangram Challenge	**Constructing/** *Group/Individual*	Combining & Creating Geometric Figures

How Much Are My Tangrams Worth?	**Practice/** *Individual/Partner*	Combining & Creating Geometric Figures
How Many Different Ways? G.1 G.2	**Practice/** *Individual/Partner*	Combing Shapes to Fill an Area
Tangram Puzzle	**Practice/** *Individual/Partner*	Using Shapes to Create a Larger Shape
Quadrilateral Challenge G.1	**Constructing/** *Individual/Partner/Group*	Defining Quadrilaterals
Quadrilateral Riddles G.1	**Practice/** *Individual/Partner*	Defining Quadrilaterals
What Do You See? G.1	**Practice/** *Individual*	Comparing/Contrasting Shapes
What's the Connection?	**Constructing/** *Groups of 4*	Comparing Quadrilaterals
Pattern Block Fractions G.2	**Constructing/** *Partner*	Partitioning Shapes
Picture Pie G.2	**Practice/** *Individual/ Partner*	Using Shapes to Create Art
Pattern Block Graphing	**Constructing/** *Individual/ Partner*	Constructing Shapes to Create Pictures; Collect Data and Create Graphs
I Has, Who Has? G.2	**Practice/** *Group*	Using Pictorial Representation of Fractions
Measure My Shapes MD.4	**Constructing/** *Individual/Partner*	Measuring Sides to Create Line Plots
My Geometric Booklet G.1 G.2	**Constructing/** *Individual/ Partner/Group*	Reasoning with shapes, Partitioning Shapes
Choice Board G.1 G.2 MD.3 MD.4	**Culminating Task**	Reasoning with shapes, Partitioning shapes, Representing and interpreting data

CONTRUCTION TASK: WHAT MAKES A SHAPE?



STANDARDS FOR MATHEMATICAL CONTENT

MCC3.G.1 Understand that shapes in different categories (e.g., rhombuses, rectangles, and others) may share attributes (e.g., having four sides), and that the shared attributes can define a larger category (e.g., quadrilaterals). Recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories.

STANDARDS FOR MATHEMATICAL PRACTICES

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

BACKGROUND KNOWLEDGE

Students should have had experiences with common plane figures and the identification of their sides and angles. Students should also be familiar with grouping and ways to express their findings using common graphic organizers.

ESSENTIAL QUESTIONS

- How can I use attributes to compare and contrast shapes?
- Why are the properties of shapes important?
- How it is possible to have a shape that has fits into more than one category?

MATERIALS

- Small bag with a set of paper quadrilaterals for each student or pair of students
- Glue
- *The Greedy Triangle* by Marilyn Burns or other book about shape attributes
- "What Makes a Shape? Shapes for Sorting" student sheet, copied on colored paper
- "What Makes a Shape? Venn Diagram" student recording sheet, copied on white paper

GROUPING

Whole Group/Partner Task

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

In this task, students begin the process of exploring shapes for their many attributes and use critical vocabulary to describe and compare those shapes through higher-level thinking skills.

Part I

Teachers may want to begin this task by reading a book about shape attributes such as *The Greedy Triangle*. While reading, questions should be posed to the students that lead to the discovery of shape attributes – their similarities and differences. A list of attributes may be generated on the board throughout the reading or each student may be asked to keep a list of attributes. These words may already be on an anchor chart from the previous task.

Students may sort shapes by such attributes as number of vertices, or size of angles. Responses should clearly indicate how the shapes were grouped. Exemplary responses would include the use of a graphic organizer, explanations or labels that are clear, and appropriate mathematical vocabulary.

When students are working in pairs, the teacher should monitor the questioning and discussion between the students, and if necessary, model a discussion prior to or during the work time.

Once students have completed their Venn diagrams, encourage them to share their work. A few students can be selected during the work time to share their work and explain their thinking. Or if students have had experience sharing their work, they can be placed in small groups and each student can share their work with their group.

Part II

Students will follow the directions below from the "What Makes a Shape?" student recording sheet.

1. Cut out the shapes below.
2. Sort the shapes in different ways. (Use the list of attributes to help you think of different ways to sort the shapes.)
3. Choose two attributes and label the Venn diagram.
4. Sort your shapes in the Venn diagram leaving any shapes that don't fit outside of the Venn diagram.
5. Once you have checked your work, glue the shapes on the Venn diagram.
6. Write to explain your thinking and to describe any observations you made.

FORMATIVE ASSESSMENT QUESTIONS

- How could you describe this figure in relationship to another figure?
- Why did you place the figure here? (Indicate a section of the Venn diagram.)
- How do you know this shape is in the correct place?

- Choose one plane figure and tell me how it is used in the world and why its attributes are important in that use.
- Can you choose a shape not in the bag and tell me where it would fit on your paper and why?

DIFFERENTIATION

Extension

- Have students select different ways to compare/contrast the shapes, then compare their way of sorting with another student.
- Use solid figures instead of plane figures.
- Incorporate a writing opportunity by having students write a compare/contrast paragraph using 2 shapes.

Intervention

- Select a smaller sample of shapes. Provide the labels and a graphic organizer for students or do the reverse in a discovery model and set out some of the shapes in the organizer and let students determine the correct labels, then sort the remaining shapes.
- If students are having difficulty participating in productive conversations, the teacher should model using think-alouds or self-questioning strategies.

TECHNOLOGY CONNECTION

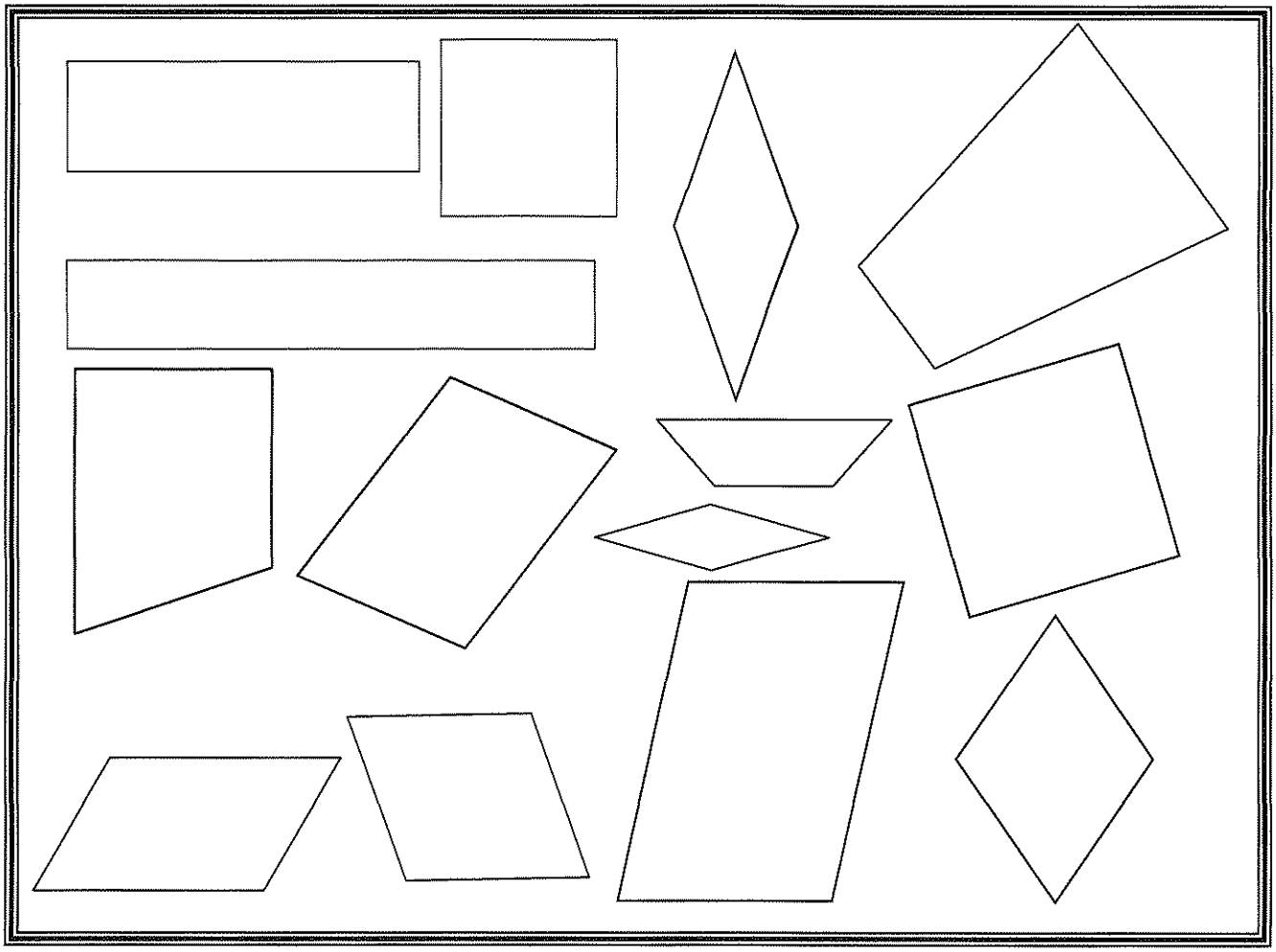
- http://nlvm.usu.edu/en/nav/frames_asid_172_g_2_t_3.html?open=activities&from=category_g_2_t_3.html Interactive geoboard from the National Library of Virtual Manipulatives
- http://nlvm.usu.edu/
- http://www.mathcats.com/explore/polygons.html - Explore Polygons
- http://www.math-play.com/Polygon-Game.html - Name the Shape
- http://nlvm.usu.edu/en/nav/frames_asid_170_g_2_t_3.html?open=activities&from=category_g_2_t_3.html – Compose Shapes
- http://www.learner.org/courses/learningmath/video/geometry/wmp/geo_10_k5_ch1.html - Video of teacher using Venn Diagram to sort polygons with whole class

Name _____ Date _____

What Makes a Shape?

Shapes for Sorting

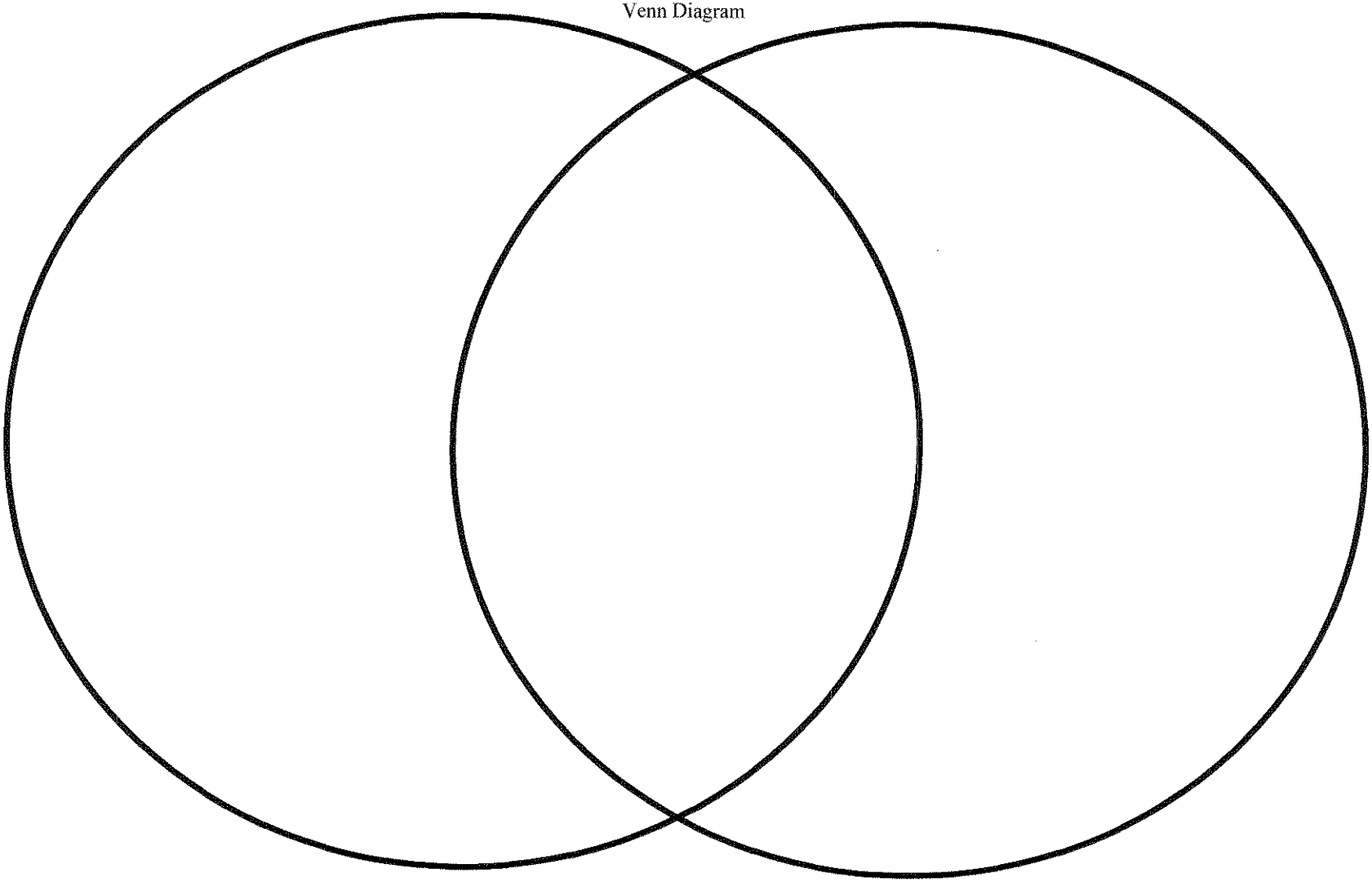
1. Cut out the shapes below.
2. Sort the shapes in different ways. (Use the list of attributes to help you think of different ways to sort the shapes.)
3. Choose two attributes and label the Venn diagram.
4. Sort your shapes in the Venn diagram leaving any shapes that don't fit outside of the Venn diagram.
5. Once you have checked your work, glue the shapes on the Venn diagram.
6. Write to explain your thinking and to describe any observations you made.



Name _____ Date _____

What Makes a Shape?

Venn Diagram



CONSTRUCTNG TASK: PROPERTIES OF QUADRILATERALS

Adapted from Property Lists for Quadrilaterals Van de Walle Activity 8.8

STANDARDS FOR MATHEMATICAL CONTENT

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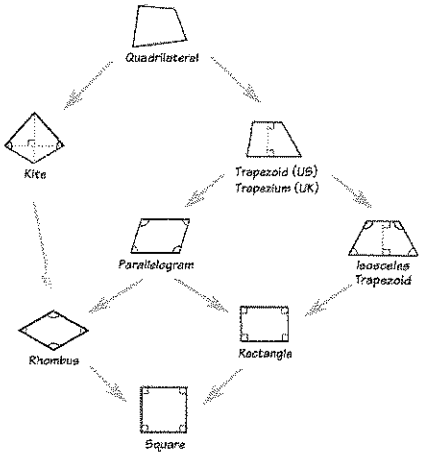
BACKGROUND KNOWLEDGE

Throughout this unit, the goal for third grade students is to begin to understand that quadrilaterals are all four sided closed polygons. While angles and lines have not been studied yet (this will be addressed in 4th grade standard CCM4.G.1), it is important for students to begin to see that the angles can be square (right), skinny (acute) or fatter than a square (obtuse). Use index cards, set squares, or corners of paper to compare angles. Accept terms students use as a teachable moment, when appropriate. The same applies with talking about the sides. Students may say opposite sides or the sides that run into each other. Within the broad category of quadrilaterals are trapezoids, parallelograms, rhombuses, rectangles, and squares. Through many activities, students need to begin to understand the categories of two-dimensional shapes (see Van de Walle page 221 for descriptions).



For Teacher Reference ONLY – Taken from
http://www.regentsprep.org/regents/math/geometry/GP9/LQuad.htm

Quadrilateral: A quadrilateral is any four sided figure. Do not assume any additional properties for a quadrilateral unless you are given additional information.

Trapezoid: A trapezoid has ONLY ONE set of parallel sides. When proving a figure is a trapezoid, it is necessary to prove that two sides are parallel and two sides are not parallel

Parallelogram: A parallelogram has 2 sets of parallel sides, 2 sets of congruent sides, opposite angles congruent, consecutive angles supplementary, diagonals bisect each other and the diagonals form 2 congruent triangles

Rectangle: The rectangle has all of the properties of the parallelogram, PLUS 4 right angles, and diagonals congruent

Rhombus: The rhombus has all of the properties of the parallelogram, PLUS 4 congruent sides, diagonals bisect angles, diagonals perpendicular

Square: The square has all of the properties of the parallelogram AND the rectangle AND the rhombus.

ESSENTIAL QUESTIONS

- Is it possible for a square to be a rectangle?
- Why do some quadrilaterals look so much alike?
- Is a rectangle a rhombus?
- Can some shapes be called other names?

MATERIALS

- Student Recording Sheet
- Index Cards (used to compare angles and sides)

GROUPING

Partner or Group

TASK DESCRIPTION, DEVELOPMENT , AND DISCUSSION

In this task, students will look at examples of rhombuses, rectangles, and squares to make property lists of quadrilaterals. Students will use the index card to check angles, compare side lengths and draw lines if needed. Encourage students to use "at least" when describing how many of something the shape has. For example, a rectangle has at least 4 square corners. Have students compare sides (length), and angles (square, smaller than square, larger than square). Some students may begin to see diagonals and symmetries of the shapes. Have groups share what they discovered together (remember that defending arguments and critiquing the reasoning of others is a major part of mathematic instruction!) and create a class list for each shape.

FORMATIVE ASSESSMENT QUESTIONS

- Did you notice anything particular about squares?
- How do you know that a quadrilateral is a rhombus or a rectangle?
- Why do you think that a rectangle, rhombus, and a square are all parallelograms?
- Is a trapezoid also a parallelogram?

DIFFERENTIATION

Extension

- As this task exists currently, it is considered to be at level 1 of the van Hiele geometric thinking, which is appropriate for third grade. According to Van de Walle, most fourth and fifth graders will still be at a level 0 or 1. Students that need an extension might consider doing Activity 8.11 called Minimal Defining Lists on page 230 or Activity 8.12 called True or False? On page 231 in the 3-5 Van de Walle resource book.

Intervention

- This task will be difficult for the majority of your students. By working with a partner, the struggling learner can begin to understand that some shapes fit into several categories because of the properties that they share. For instance, a square is a rectangle, a rhombus, a parallelogram and a quadrilateral because it shares properties. Many examples may need to be provided for the struggling learner. Technology can provide many opportunities for the student. See Technology Connections.

TECHNOLOGY CONNECTIONS

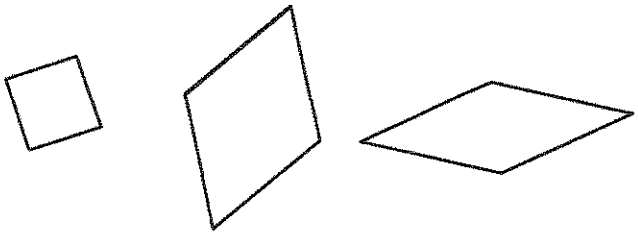
- http://www.mathsisfun.com/geometry/quadrilaterals-interactive.html - allows students to move corners to make sizes.
- http://www.interactivestuff.org/match/maker.phtml?featured=1&id=24 – matching game
- http://www.mathplayground.com/matching_shapes.html - matching games (includes kite)

Name:_____ Date:_____

Quadrilaterals

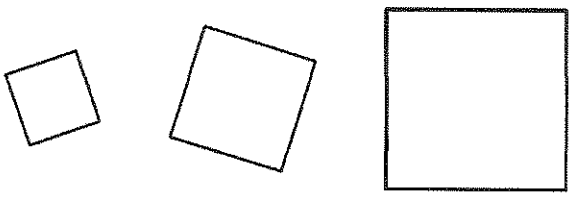
Directions: Look at of the different shapes. Write down anything you notice about the type of shape. Look at the corners (angles) and the sides. Use an index card corner (square corner) to write down what you notice about the corners. Also use the index card to help you measure the length of the sides. Begin to define rhombus, square, rectangle and parallelogram.

These are all rhombuses.



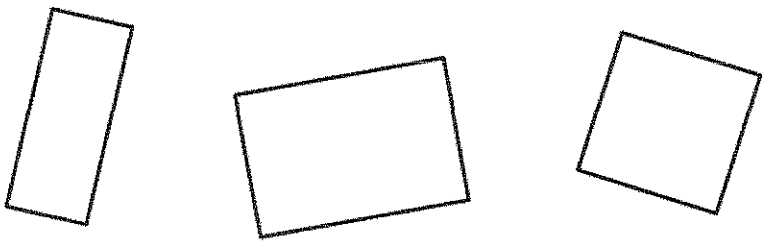
Observations about rhombuses

These are all squares.



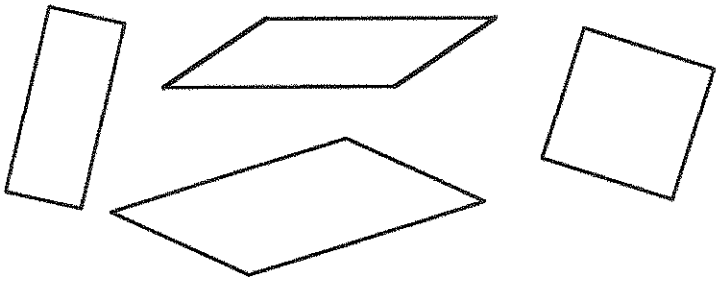
Observations about squares

These are all rectangles.



Observations about rectangles.

These are all parallelograms.



Observations about parallelograms.

PRACTICE TASK: CAN YOU FIND IT?

Adapted from North Carolina Math Instructional Resources

STANDARDS FOR MATHEMATICAL CONTENT

MCC3.G.1 Understand that shapes in different categories (e.g., rhombuses, rectangles, and others) may share attributes (e.g., having four sides), and that the shared attributes can define a larger category (e.g., quadrilaterals). Recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories.

STANDARDS FOR MATHEMATICAL PRACTICES

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

BACKGROUND KNOWLEDGE

Students often have trouble seeing shapes within other shapes. They also have a difficult time if the shape is a different orientation than is seen most often. Most students will be able to draw the shapes requested. For those that struggle, provide models of the shapes requested.

ESSENTIAL QUESTIONS

- What are some ways that a hexagon (or pentagon) can look?
- Do rectangles and squares always look the same?
- Does the direction that a shape is facing change the way it looks? Does it change the shape's name?

MATERIALS

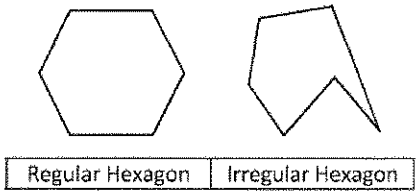
- Can You Find It? Student Resource Sheet or http://wps.ablongman.com/wps/media/objects/3464/3547873/blackline_masters/BLM_40.pdf
- Color pencils or crayons

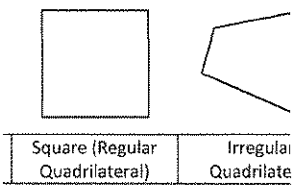
GROUPING

Individual or Partner

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION

You may wish to open this lesson by reading a book such as *Shape Spotter* by Megan Bryant, *The Story of Goldie Locks and the Three Squares* by Grace Maccarone, or a similar book. Then, students will use the *Can You Find It?* student resource sheet to locate a rectangle, square, triangle, hexagon, pentagon, a quadrilateral that does not look like a rectangle or square, trapezoid, rhombus, a different looking hexagon, and a different looking trapezoid. They may color each shape a different color and then put some type of marking on all of the quadrilaterals, or you may want them to color all quadrilaterals the same color. Many students struggle to see irregular shaped polygons as fitting into the category with the regular shaped polygons. For instance, most students only know that a hexagon looks like ⬡ but a hexagon is **any** six sided closed figure. An important part of the task is to allow students to compare their drawings. This will help students who struggle with orientation of shapes.





Read Alouds

FORMATIVE ASSESSMENT QUESTIONS

- Did all of your quadrilaterals have a square corner?
- Do all of your shapes look like a classmate's shapes? they alike? What attributes help you know that the sh
- How do you know you drew a square and a rhombus

DIFFERENTIATION

Extension

- Students who need an extension can draw different quadrilaterals and label them. They could also try drawing the shapes in a different orientation or direction. For example, if the trapezoid looks like ⏢, have students draw the trapezoid like ⏢.

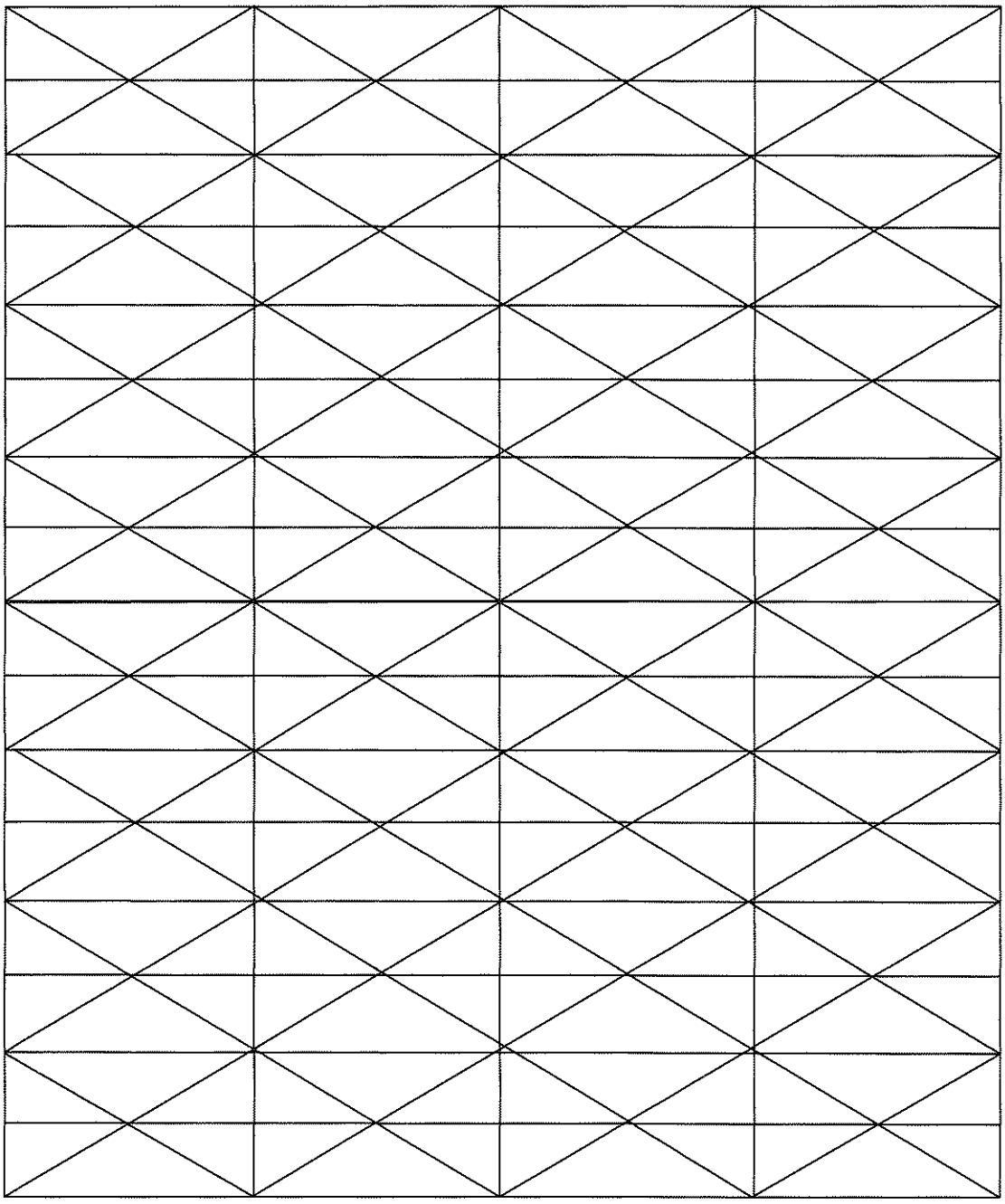
Intervention

- Provide models of the shapes for students to be able to place on the grid to trace around. Remind students that shape names also tell the number of sides. For instance, a quadrilateral is any closed figure with 4 sides and a hexagon means any closed figure with 6 sides.

CAN YOU FIND IT?

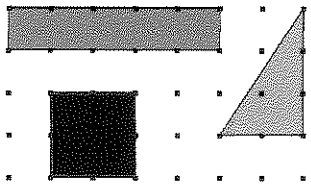
Find the shapes listed below. Once you find it, use different colors to shade in or trace around the shape. Also color code the directions.

• Rectangle • Square	• Triangle • Hexagon • Pentagon	• Quadrilateral that does not look like a Rectangle or Square • Trapezoid • Rhombus	• A Different looking Trapezoid • A Different looking Hexagon



CONSTRUCTING TASK: GEOBOARD GEOMETRY GURU

STANDARDS FOR MATHEMATICAL CONTENT



MCC3.G.1 Understand that shapes in different categories (e.g., rhombuses, rectangles, and others) may share attributes (e.g., having four sides), and that the shared attributes can define a larger category (e.g., quadrilaterals). Recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories.

MCC3.G.2 Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole. *For example, partition a shape into 4 parts with equal area, and describe the area of each part as 1/4 of the area of the shape.*

STANDARDS FOR MATHEMATICAL PRACTICES

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

BACKGROUND

Students should begin to use what they have learned about properties from the previous activities to be able to begin to classify shapes. Begin with shapes learned in previous grades and move up to focusing on quadrilaterals.

Before beginning this task, students should be familiar with common quadrilaterals and the identification of their sides and angles. Also, they should be able to use a geoboard and transfer that information to paper. Some students may need specific instructions on how to transfer figures to the paper (e.g. counting the spaces between dots and directionality). Finally, students should be able to make multiple representations of the same shape with variance in size and orientation, and still determine it to be the same shape based on its attributes.

ESSENTIAL QUESTIONS

- How can I use attributes to compare and contrast shapes?
- Is it possible to make shapes that are quadrilaterals that are not shaped like what I might be used to?

MATERIALS

- Geoboards
- Rubber bands
- "Geoboard Geometry Guru" student recording sheet (3 per student)

GROUPING

Whole Group/Individual Task

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Part I

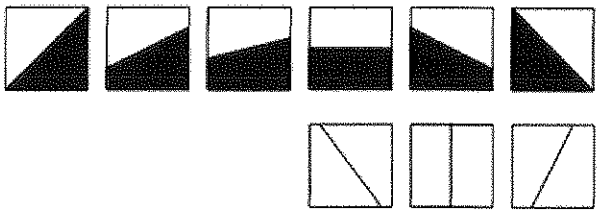
In this task, students begin exploring how to create plane figures using straight lines and angles and then discover common features of rectangles, squares, and triangles.

Students should be given the opportunity to explore freely with the geoboard and rubber bands before working this task. Also, teachers may want to begin this task by giving students opportunities to explore the geoboard by making a variety of shapes, lines, and angles. Throughout this task teachers should promote the key vocabulary of open figure, closed figure, polygon, rhombus/rhombi, rectangle, square, quadrilateral, parallelogram, and trapezoid. Also, students should be encouraged to use these key vocabulary words.

At the completion of this task the class will have created definitions for rectangle, square, rhombus, and trapezoid. These can be posted in the classroom along with each shape's attributes.

Part II

Have students return to the geoboard and begin to explore partitioning the shapes into equal parts. Is it possible to make all of the quadrilaterals into equal parts of two, three, four, six, and eight? Guide students through making sense of equal parts/areas. An anchor chart may be drawn to show how each quadrilateral can be partitioned into equal areas. Remember that each shape can be partitioned in multiple of ways. For instance, a square can be divided into half in all of these different directions:



Task Directions

Students should be challenged to make different shapes that describe one or more properties of shapes. Pose questions to students like: Can you make a shape with just one square

corner and four sides? Can you make a shape with 2 square corners (or 3, 4, 5, etc. square corners?) Can you make a shape that has two pairs of sides that go the same way or are parallel? Show student's examples so that students can begin to understand that there is more than one way to make a shape with the same properties. The focus should be on looking at the different quadrilaterals that can be created. Students are asked to create all of the different rectangles they can find on the geoboard and then record them on geoboard paper. Ask students to say aloud or write as many complete sentences as they can that begin with "All (or none, or some) of the rectangles…." in order to draw general conclusions about the shapes. After general conclusions have been stated or recorded, the teacher can lead the students to create an appropriate definition for a rectangle.

Follow the same procedures to create an appropriate definition for a square, rhombus, parallelogram, and trapezoid (review from 2nd grade). Note: This activity might take more than 1 day in order for students to get to explore each shape and think about what makes each shape different. For a more descriptive table, please see Table 8.1 "Categories of Two- Dimensional Shapes" on page 221 and Figure 8.11 "Classifications of Two-Dimensional Shapes" in the 3-5 Van de Walle text, page 222.

Shape		Description
Classified by sides	Equilateral	All sides are congruent.
	Isosceles	At least two sides are congruent.
	Scalene	No two sides are congruent.
Classified by angles	Right	Has a right angle
	Acute	All angles are smaller than a right angle.
	Obtuse	One angle is larger than a right angle.
Quadrilaterals		Polygon with exactly four sides
Trapezoid		At least on pair of parallel sides
Parallelogram		Two pairs of parallel sides
Different Classes of Parallelograms	Rectangle	Parallelogram with a right angle.
	Rhombus	Parallelogram with all sides congruent
	Square	Parallelogram with a right angle and all sides congruent.

In addition to recording the defining properties, the shapes that students have drawn on the geopaper might be used as a formative assessment for MCC3.G.2. Have students use the drawn shapes or the geoboards to show what they know about partitioning a shape into halves, thirds, fourths, sixths and eighths. Allow students to show a variety of ways to partition the shapes. It is important that students continue to develop their understanding of equal areas. More activities will follow that continue the exploration for MCC3.G.2

FORMATIVE ASSESSMENT QUESTIONS

- What is your definition of a rectangle (or square, rhombus, trapezoid, or parallelogram)?
- What are the attributes of a rectangle (or square, rhombus, trapezoid, or parallelogram)?
- How can you change this shape by changing only one attribute?

- Is this shape still a (rectangle..or any shape) if I turn the geoboard slightly? (Look to see if orientation confuses students)
- Show half (or thirds, fourths, sixths, eighths) in a different way.

DIFFERENTIATION

Extension

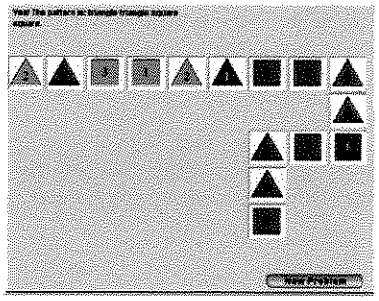
- Have students create a morph chain of a shape changing one attribute at a time and label each morphed shape with its description. (For example: small, red equilateral triangle morphs into a small, blue, equilateral triangle and then into a small, blue, isosceles triangle, etc.)

Intervention

- Provide the definition of the shape first and deconstruct the definition while creating each part of the shape until the shape is complete. Then have students create a congruent shape. Finally ask students to create a non-congruent shape, changing one attribute.

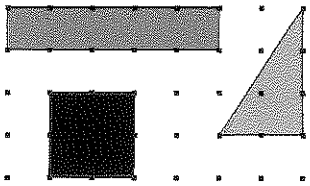
TECHNOLOGY CONNECTION

- http://nlvm.usu.edu/en/nav/frames_asid_172_g_2_t_3.html?open=activities This site offers an easy to use virtual geoboard.
- http://nlvm.usu.edu/en/nav/frames_asid_271_g_2_t_3.html?open=instructions&from=category_g_2_t_3.html Students follow a pattern to create attribute trains based on color, shape, or the number on the shape (e.g. triangle, square pattern; red, red, blue pattern; triangle, square, square pattern; 2,3,1 pattern).



Name _____ Date _____

Geoboard Geometry Guru



PRACTICE TASK: QUADRILATERAL RIDDLES

Adapted from Pennsylvania DOE activity Attributes of Two-Dimensional Shapes

STANDARDS FOR MATHEMATICAL CONTENT

MCC3.G.1. Understand that shapes in different categories (e.g., rhombuses, rectangles, and others) may share attributes (e.g., having four sides), and that the shared attributes can define a larger category (e.g., quadrilaterals). Recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories.

STANDARDS FOR MATHEMATICAL PRACTICES

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

BACKGROUND KNOWLEDGE

Students have had some opportunities to look at quadrilaterals and begin to understand the categories that the shapes fit in based on the properties of the shapes. Additional time in studying the shapes may be needed based on the van Hiele levels of Geometric Thinking. Additional information about the levels may be found in the Van de Walle Resource book on pages 206-208

ESSENTIAL QUESTIONS

- How can we use two- dimensional shapes to solve problems?
- How do attributes help us describe shapes?
- Why is it important to know what quadrilaterals are and the differences between them?

MATERIALS

- Display the Riddle sheet using a document reader/ overhead projector or write the sentences on the board for students to copy.
- Varied of quadrilaterals for visuals

GROUPING

Independent or Partner Task

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION

In this task, students will use the mathematical vocabulary developed through this unit to describe the attributes of quadrilaterals. Students will use 2 quadrilaterals to fill out the riddle. The riddle follows the pattern:

If I were a _____
_____
_____
_____, I would have _____
_____
_____
_____
_____. I would have _____
_____
_____
_____. But I would not have _____
_____
_____ because that would be _____
_____
_____
_____
_____
_____.

The first three blanks refer to one quadrilateral; the last two blanks refer to the other quadrilateral.

Example: If I were a square, I would have 4 sides. I would have 4 corners. But I would not have only one set of parallel lines (or lines that run in the same direction) because that would be a trapezoid.

Throughout this unit, students should begin to identify and describe the attributes of various quadrilaterals beyond the common characteristic. What makes a square a rectangle but a rectangle can't be a square?

FORMATIVE ASSESSMENT QUESTIONS/PROMPTS

- What part of the task was the hardest for you?
- How would you explain to your parents or guardians the difference between the quadrilaterals?
- Why should you know that different shapes can be in the same category?
- When would you use this information as an adult?

DIFFERENTIATION

Extension:

- Have students further investigate the difference between parallelograms and trapezoids. Then have them can write a riddle based on their findings.

Intervention:

- Allow students to use other shapes with the quadrilaterals.

TECHNOLOGY CONNECTIONS

- http://illuminations.nctm.org/LessonDetail.aspx?id=L350 – Complete lesson on rectangles and parallelograms
- http://illuminations.nctm.org/LessonDetail.aspx?id=L813 – Shape Up Lesson from Illumination

Name _____ **Date** _____

Quadrilateral Riddle

Choose two quadrilaterals that are similar but have at least one difference. The first three lines of the riddle refer to one quadrilateral and its attributes. The last two lines of the riddle refer to the second quadrilateral and its attribute(s) that make it different from the first quadrilateral. Use specific math vocabulary to describe the attributes.

If I were a _____

I would have _____.

I would have _____.

But I would not have _____

Because that would be _____.

Optional: try another riddle using two new quadrilaterals.

If I were a _____

I would have _____.

I would have _____.

But I would not have _____

Because that would be _____.

PRACTICE TASK: WHAT'S THE CONNECTION?

Adapted from the lesson, Quad Math from http://nrich.maths.org/6998/note

STANDARDS FOR MATHEMATICAL CONTENT

MCC3.G.1. Understand that shapes in different categories (e.g., rhombuses, rectangles, and others) may share attributes (e.g., having four sides), and that the shared attributes can define a larger category (e.g., quadrilaterals). Recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories.

STANDARDS FOR MATHEMATICAL PRACTICES

1. Make sense of problems and persevere in solving them.
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5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

BACKGROUND KNOWLEDGE

Students have begun to learn more about quadrilaterals and their properties. In this task, students will use what they have learned about shapes to make a set of cards that are related to each other in a similar way.

ESSENTIAL QUESTIONS

- What are some things you have learned about quadrilaterals?
- How do you know the difference between a square, a rectangle, a trapezoid, and a rhombus?
- What might an irregular shaped quadrilateral look like?

MATERIALS

- A Rule card for every group of 4 players
- Page 1 and 2 for every group of 4 players
- Math Journal

GROUPING

Group of 4 – a 5th person could be in the group as a rule keeper or communicator for the group.

TASK DECRIPTION

Students must follow the rules on the Rule Cards to play this game. They will help each other to form a group of 4 cards that relate to each other. To play, students will get into groups of 4. If there is a need, there can be a 5th person in each group who will act as the Rule Keeper or the communicator at the end. Distribute a rule card and the 16 cards to each group of players. Within the groups, distribute the 16 cards so that each player gets 4 cards. Place all cards face up and in front of each player where all players can see the cards. REMEMBER, the rules of the game include: no talking during the game, players can only give cards (not take), must have 2 cars in front of them at all times, and the team is successful when all 4 players have 4 cards that relate to each other. The goal of the game is that students will need to end up with a set of four cards in front of them that are related to each other in a similar way. The task is only successful if everyone on the team has completed their set.

For the teacher information only: the 16 cards consist of 4 squares, 4 rectangles, 4 trapezoids, and 4 irregular shaped quadrilaterals. Some groups may see a set consists of having 1 of each type of shape while others may see a set as having only one type of set. Either is correct **IF** students are able to explain their set.
When complete, have students write in their math journal their experience of the activity.

FORMATIVE ASSESSMENT QUESTIONS

- How are your cards related?
- What could have made this task easier?
- Is there another way to form a set with these cards?
- Did you all agree on the set to begin with or did you have to trade cards several times?
- What if a rhombus had been added to the deck of cards? Could you have still formed a set?

DIFFERENTATION

Extension

- Create a similar game using more shapes, including rhombus and kite.

Intervention

- If student struggled to create sets that were related, have them talk about the cards and sort into groups based on their discussions. Make a chart to help the struggling student start to see the differences in the shapes.

WHAT'S THE CONNECTION? Rule Cards

Rules You must not talk or use sign language. You can **give** cards to someone else. You must always have at least two cards in front of you. You **must not take** cards. You are only finished when everyone has a set of matching cards.	**Rules** You must not talk or use sign language. You can **give** cards to someone else. You must always have at least two cards in front of you. You **must not take** cards. You are only finished when everyone has a set of matching cards.
Rules You must not talk or use sign language. You can **give** cards to someone else. You must always have at least two cards in front of you. You **must not take** cards. You are only finished when everyone has a set of matching cards.	**Rules** You must not talk or use sign language. You can **give** cards to someone else. You must always have at least two cards in front of you. You **must not take** cards. You are only finished when everyone has a set of matching cards.
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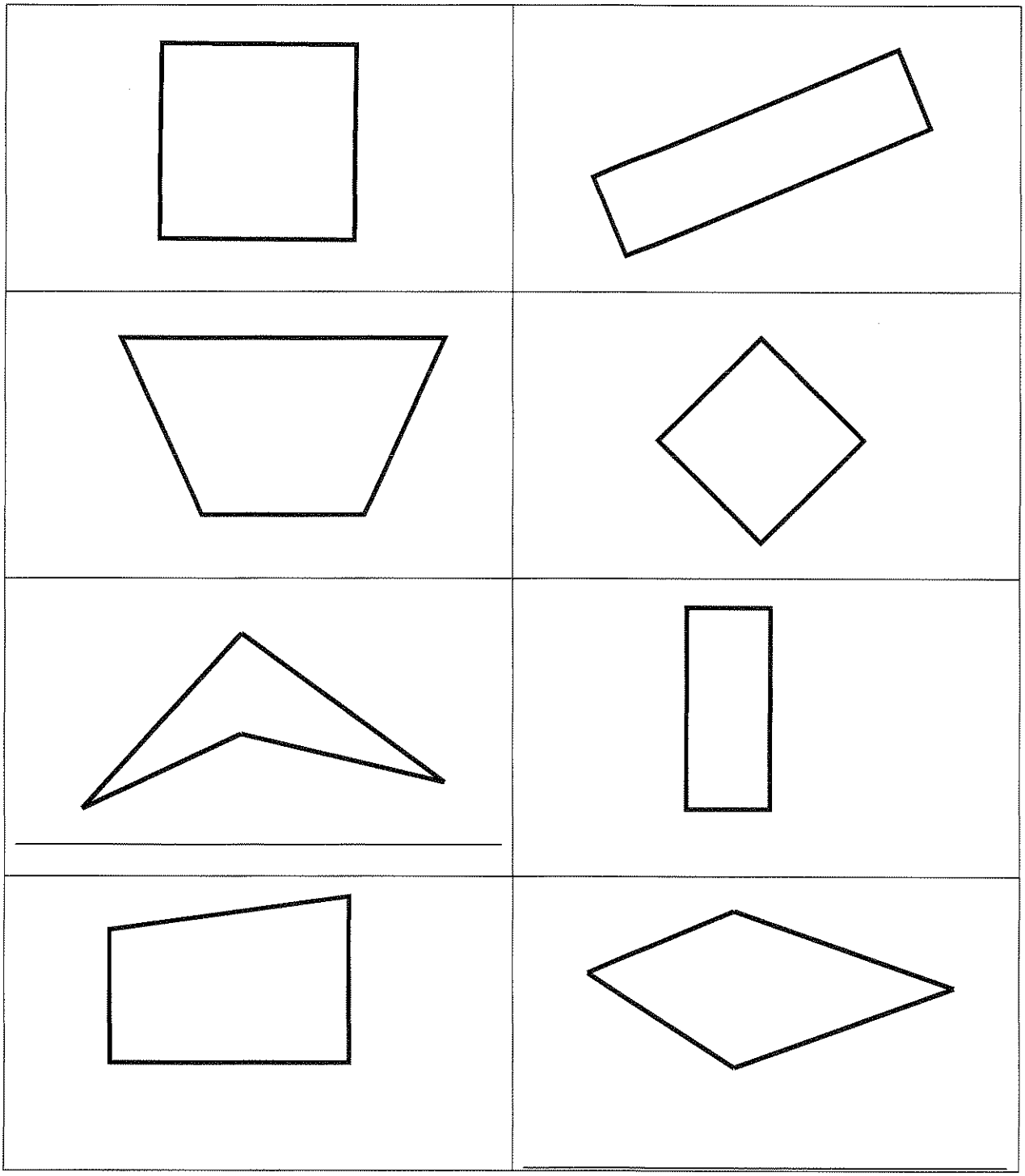
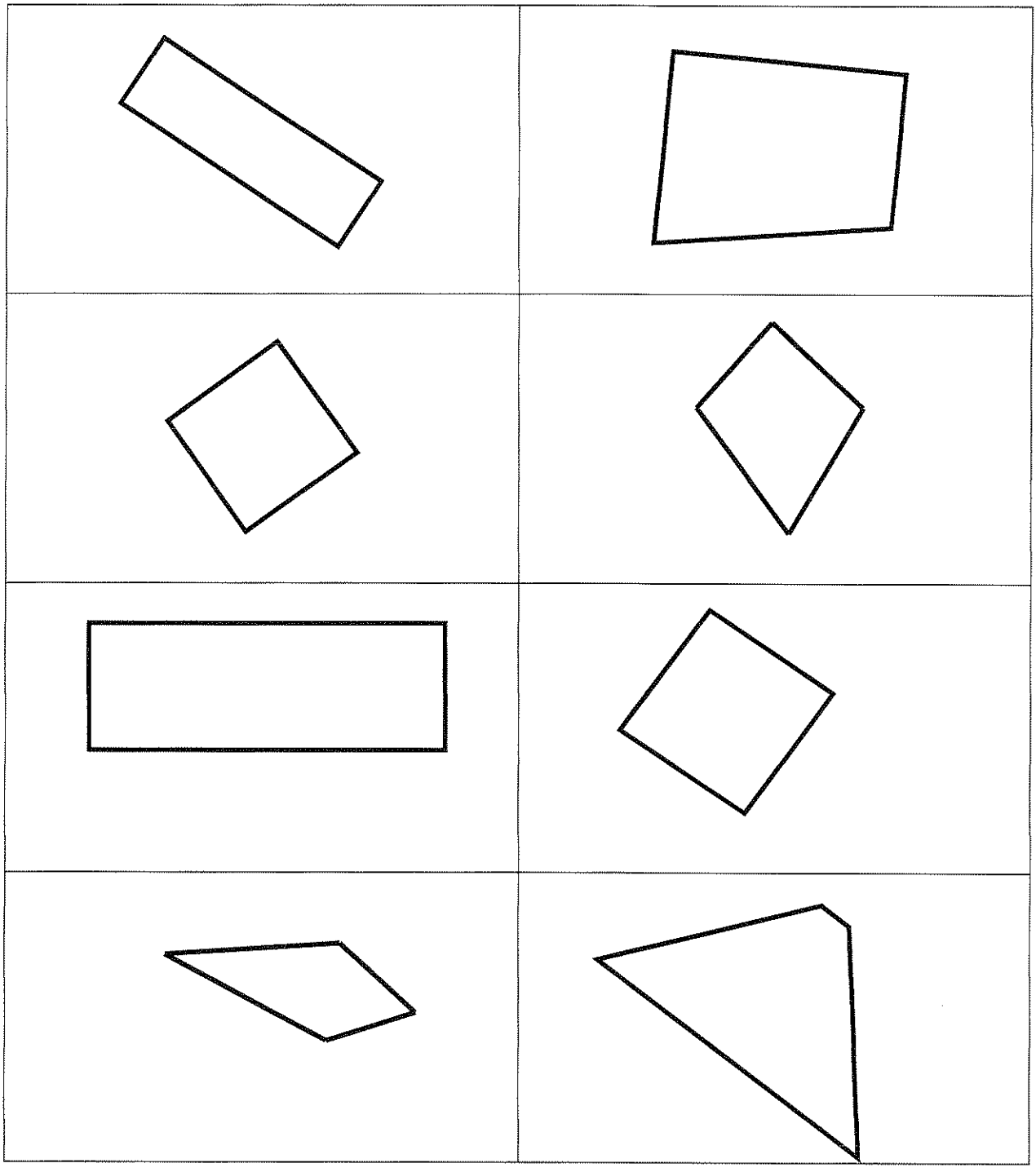
WHAT'S THE CONNECTION? Playing Cards Page 1



WHAT'S THE CONNECTION? Playing Cards Page 2



CONSTRUCTING TASK: PATTERN BLOCK FRACTIONS

Adapted from the Lesson "Fun with Pattern Blocks" from NCTM's Illuminations
http://illuminations.nctm.org/LessonDetail.aspx?ID=L343

STANDARDS FOR MATHEMATICAL CONTENT

MCC3.G.2 Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole. *For example, partition a shape into 4 parts with equal area, and describe the area of each part as 1/4 of the area of the shape.*

STANDARDS FOR MATHEMATICAL PRACTICES

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

BACKGROUND KNOWLEDGE

Concepts about fractions are basic to mathematics but can pose challenges for students. In elementary schools, the most frequently used fraction models are the region and set models. This lesson exposes students to the region model and gives an opportunity for them to develop a thorough understanding of this model in multiple applications. As students work with a variety of fraction models in contexts that promote reasoning and problem solving, they develop a more thorough understanding of fractions and the relationships among them.

As the students work to understand fraction relationships using the region model, it is appropriate to work with concepts on a continuum from concrete to abstract. This lesson first exposes the students to a concrete representation of the region model through work with pattern blocks. As the students move toward more abstract work, it is appropriate to introduce semi-concrete representations. Having the students record fraction relationships pictorially gives them the opportunity to be exposed to such a model.

ESSENTIAL QUESTIONS

- Is there a way to represent the red trapezoid using blue and green pattern blocks?
- Can you cover the red trapezoid using only one color?
- What does this tell us about the relationship between the blue rhombus and the green triangle?
- Are there other ways to represent various pattern blocks (for example, the yellow hexagon) using more than one color pattern block?

- How do the relationships discovered with the pattern blocks help us understand fractions and area?
- What does 1/3 look like in the hexagon? What does 1/3 look like in the trapezoid? What does 1/3 look like in the rhombus? Does one shape represent 1/3 in all of the shapes?

MATERIALS

- Pattern Blocks (only hexagons, trapezoids, rhombuses and triangles are needed)
- Pattern Block Relationships Recording Sheet

GROUPING

Partner Task

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION

For this lesson, the students need a set of pattern blocks. (Only the hexagons, trapezoids, rhombuses, and triangles are needed. The students do not use the square or the rhombus for this lesson.) If the students are seated at tables, one complete set of pattern blocks should serve an entire group.

The most common regions studied at the elementary grade levels are the rectangle and circle. The "region" represents the "whole," and parts of the region are all congruent. The students should be exposed to a variety of shapes and not limited to the rectangle and circle. It is important that the students work with a variety of regions so that they do not think of the region as only "pieces of a pie." For this reason, pattern blocks are an appropriate tool for work with the region model.

The students should use pattern blocks to answer the questions on the Pattern Block Relationship Sheet. Have the students record as many fraction relationships as possible. You may choose to have them record the relationships in a math journal to which they may refer later. Each pair should record relationships on chart paper to share with the whole class. As each pair shares, have the students add to their journal any relationships they may have missed.

As the students work to understand fraction relationships using the region model, it is appropriate to work with concepts on a continuum from concrete to abstract. This lesson first exposes the students to a concrete representation of the region model through work with pattern blocks. Having the students record fraction relationships pictorially gives them the opportunity to be exposed to such a model.

FORMATIVE ASSESSMENT QUESTIONS

It is important to know whether the students can do the following:

- understand that a fraction is part of a whole
- state the relationship between the pattern block shapes [e.g., that there are three triangles in one red trapezoid]
- identify fractions when the whole (region) and a part of the region are given
- represent the fractional relationship between the pattern block shapes using standard form of the written notation (e.g., the green triangle is x of the blue rhombus.)
- identify the numerator in a fraction and understand that the numerator is the top number in a fraction and indicates the number of parts of the whole
- identify the denominator in a fraction and understand that the denominator is the bottom number in a fraction and indicates the number of parts into which the whole is divided

The students' recordings can be used to make instructional decisions about their understanding of fraction relationships. Areas needing additional work can be developed during subsequent lessons. Fractions will be explored more in Unit 6.

- How many triangles does it take to make a hexagon?
- Show me more than one way to make a trapezoid. Write the fraction that each pattern block represents.
- Does 1/3 represent the triangle in the rhombus and the hexagon? How do you know?

DIFFERENTIATION

Extension

If students understand the areas of the whole, some students might be ready to explore when the whole changes. Instead of representing the whole with one yellow hexagon, the students explore fractional relationships when two, three, and four yellow hexagons constitute the whole. See "Expanding our Pattern Block Repertoire" lesson from Illuminations http://illuminations.nctm.org/LessonDetail.aspx?ID=L346.

Intervention

- Most students should have used the fraction ½ on numerous occasions. Lead the students in identifying and defining the numerator and denominator. Ask the students to explain what the top number in the fraction represents. [Students should indicate that this top number is the numerator and shows the number of parts of the whole.] The students should also identify the purpose of the bottom number, or denominator, as the number that indicates the number of parts into which the whole is divided. Since students are working in partners, all students should receive support from the peer or the teacher can guide the student through effective questioning.

TECHNOLOGY CONNECTIONS

- http://ejad.best.vwh.net/java/patterns/patterns_j.shtml - Pattern Blocks
- http://nlvm.usu.edu/en/nav/frames_asid_170_g_2_t_3.html?open=activities&from=category_g_2_t_3.html – National Library of Virtual Manipulatives

Pattern Block Relationships

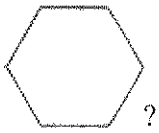
NAME _____ Date _____

How many triangles  are in one rhombus  ? _____

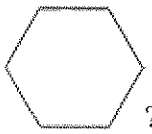
What would be the fraction of 1 triangle in the rhombus? _____

How many triangles  are in one trapezoid  ? _____

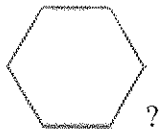
What would be the fraction of 2 triangles in the trapezoid? _____

How many triangles  are in one hexagon  ? _____

What would be the fraction of 4 triangles in the hexagon? _____

How many rhombuses  are in one hexagon  ? _____

What would be the fraction of 3 rhombi in the hexagon? _____

How many trapezoids  are in one hexagon  ? _____

What would be the fraction of 1 trapezoid in the hexagon? _____

PRACTICE TASK: PICTURE PIE

STANDARDS FOR MATHEMATICAL CONTENT

MCC3.G.2. Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole. *For example, partition a shape into 4 parts with equal area, and describe the area of each part as 1/4 of the area of the shape.*

STANDARDS FOR MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

BACKGROUND KNOWLEDGE

Students in 2nd grade will have started partitioning shapes (circles and rectangles) into equal areas of two, three, or four equal shares. In third grade, students will further develop this area by dividing shapes into halves, thirds, fourths, sixths and eighths. This activity gives students the opportunity to create pictures using fractional pieces of shapes.

In Picture Pie, Ed Emberley shows how a circle, which is divided into different fractional pieces, can be used to make pictures and patterns of all kinds.

In Picture Pie 2, Ed Emberley uses the included stencil to demonstrate how to draw a variety of things including pigs, wolves, clowns, bugs, and much more. You'll also find step-by-step instructions in both books. If these books are not available, you may use the shapes provided to create stencils, using file folders or stock paper, for students to trace around. You may shrink the pieces provided by using your copier machine to reduce each of the shapes if you wish to create smaller animals.

Clipart of circles and fractional pieces are obtained from
http://etc.usf.edu/clipart/sitemap/fractions.php
If rectangle or squares are needed, more polygons can be found at the same website.

ESSENTIAL QUESTIONS

- How can common shapes be used to create pictures?
- Is there a way to use parts of shapes to help create shapes?

MATERIALS

- Ed Emberley's books Picture Pie: A Circle Drawing Book , Picture Pie 2: A Drawing Book and Stencil or similar books with pictures made from shapes, or Ed Emberley's Website.
- Circles (see the following pages) or print smaller circle pieces from http://wps.ablongman.com/ab_vandewalle_math_6/0,12312,3547876-,00.html Blackline Masters 24, 25, 26

GROUPING

Individual or Group

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION

To begin this task, either share Ed Emberly's books (*Picture Pie* or *Picture Pie 2*) or visit his website:
http://www.edemberley.com/pages/main.aspx?section=db&subSection=capPages,
http://www.edemberley.com/pages/main.aspx?section=db.

Students will decide on a picture that they want to create. There is one circle included. Students should create fractional peices by folding the circle into halves, quarters, and eighths. This activity may take several days but can be used in a center or small group activity.

Once students finish their animals, they will create a chart to demonstrate their understandings of the fractional pieces. For example: In my animal, I used.... 6 ½ circles, 5 ¼ circles, etc.

FORMATIVE ASSESSMENTS QUESTIONS

- What was difficult about this task?
- How many of each shape did you use?
- Did you have more ½ or 1/4 shapes?
- Did you discover a faster way of making your shapes?

DIFFERENTIATION

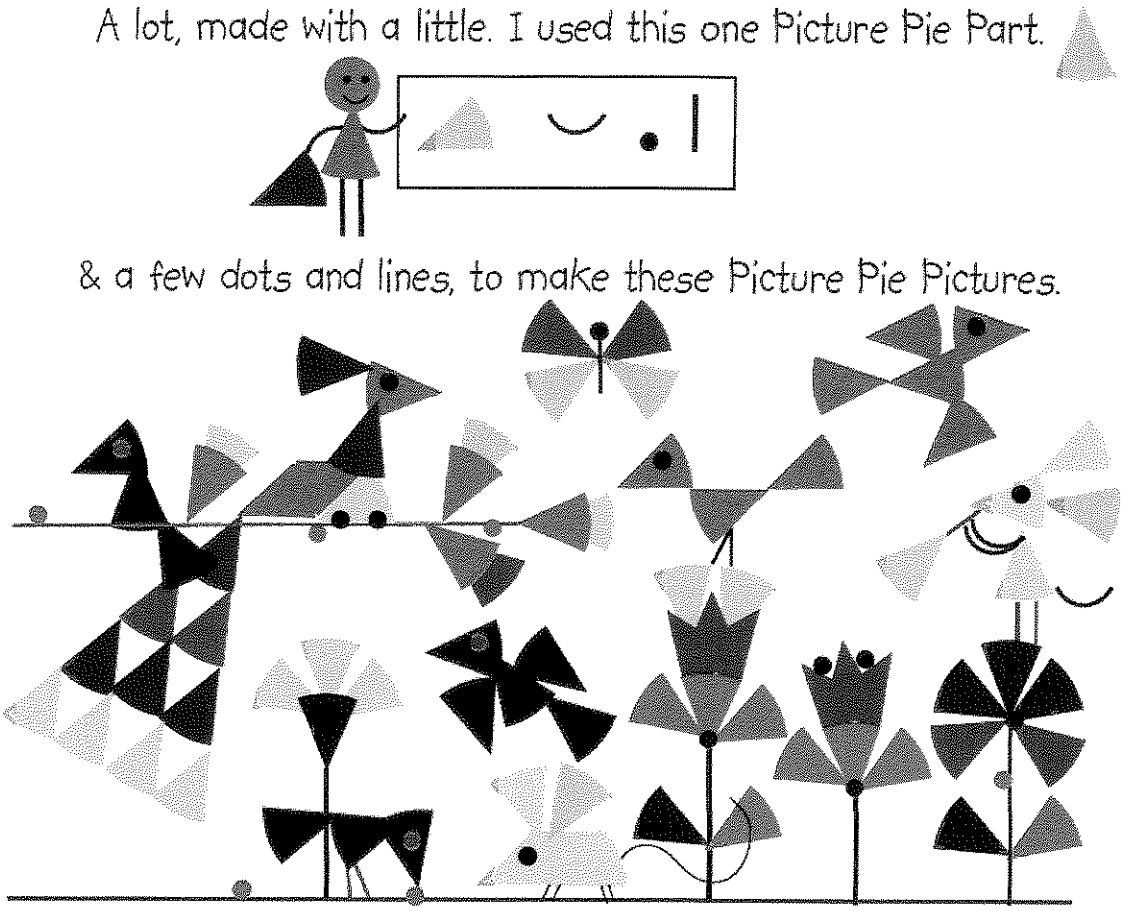
Extension

- Students should be allowed to create their own animals if desired.

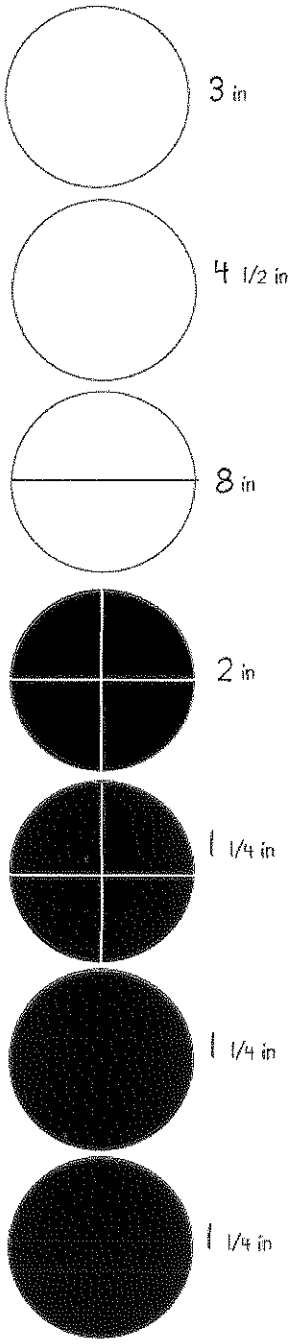
Intervention

- Students that struggle with this activity will probably need to have an example in front of them. They may also need a demonstration on how to lay the stencil onto a piece of paper to trace around. If they need help to hold the stencil while tracing, consider allow a peer to help, tape the edges of the stencil in a few spots, or use a heavy object to hold the stencil in place.

Examples of Picture Pie Pictures

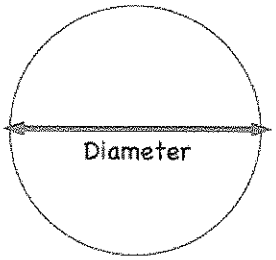


From www.edemberly.com

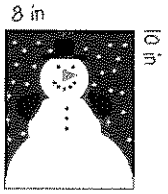


SCRATCH BUILT

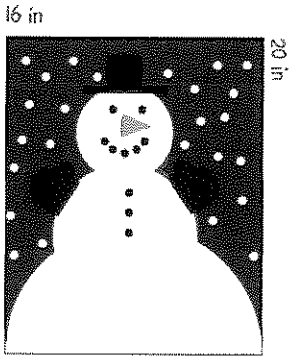
To make this Picture Pie snowman from scratch you will need to make the following seven circles.
Colors as shown.
Diameter as shown.
Divided as shown.



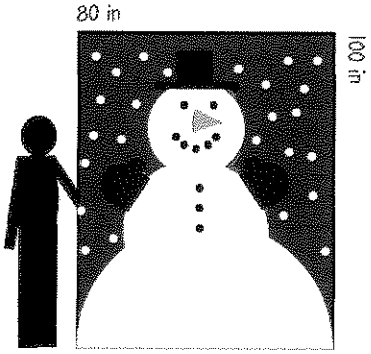
This snowman has been designed to fit on a standard sheet of construction paper, as shown.



For the 8X10 size only, You can save time, by using a standard office punch to make the mouth, eyes, and buttons.

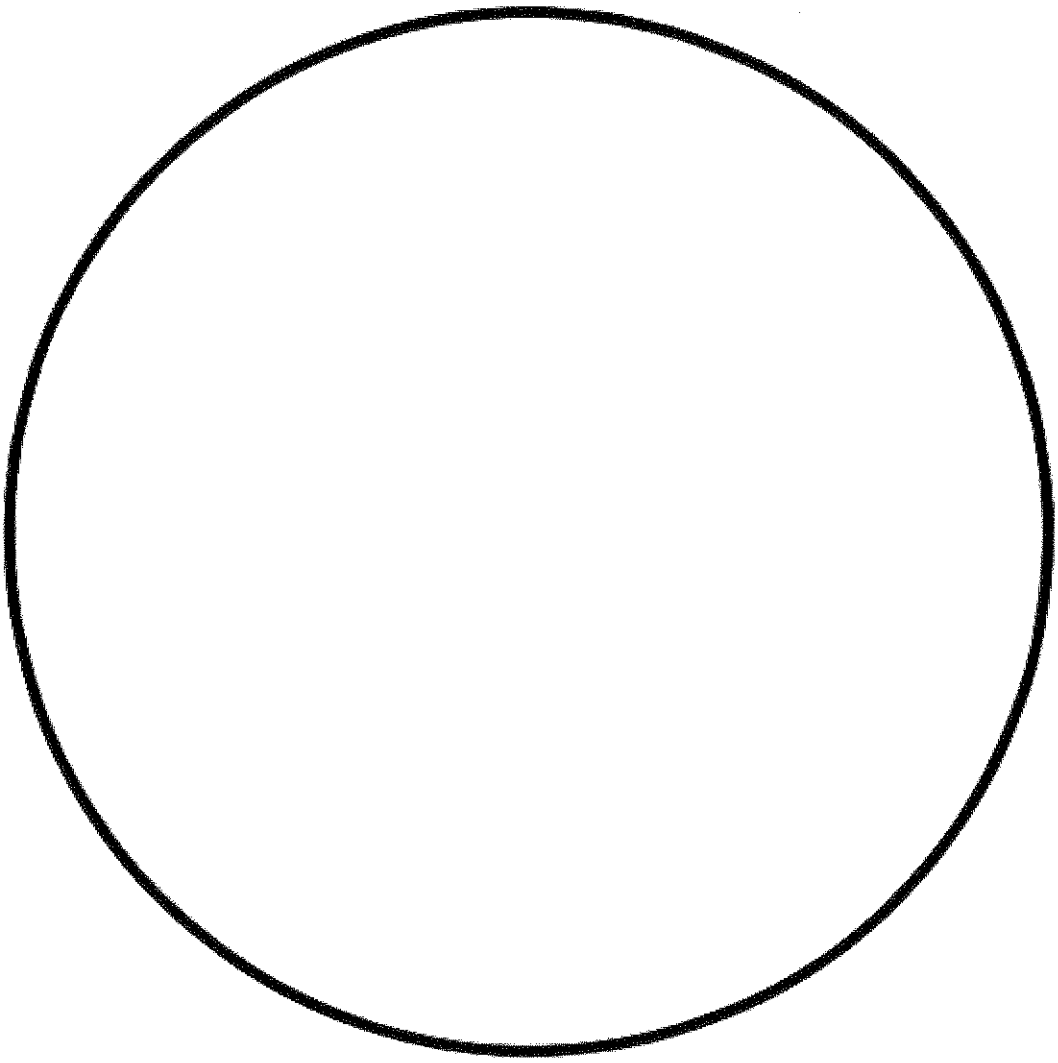


Double all measurements to make this same exact snowman fit a 16X20 inch background.



Multiply all measurements by 10, to make this same exact snowman fit an 80 X 100 inch background.

Fraction Pieces



One Whole

PRACTICE TASK: I HAVE, WHO HAS?

Adapted from Mathwire.com's Game I have, Who Has?

STANDARDS FOR MATHEMATICAL CONTENT

MCC3.G.2. Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole. *For example, partition a shape into 4 parts with equal area, and describe the area of each part as 1/4 of the area of the shape.*

STANDARDS FOR MATHEMATICAL PRACTICES

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.

BACKGROUND KNOWLEDGE

Students will have had experience dividing circles and rectangles into two, three, and four equal shares in third grade. This task will help students further develop their understanding of partitioning shapes into parts with equal area by using halves, thirds, fourths, sixths, and eighths.

ESSENTIAL QUESTIONS

- What is the purpose of studying fractions?
- How do you know if a shape shows _____(halves, thirds, fourths, sixths, or eighths?)
- Describe what a fraction looks like in a shape?

MATERIALS

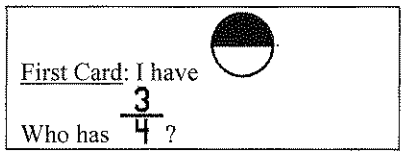
- I Have, Who Has Game Cards

GROUPING

- Whole Group

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION

Print out and cut apart the three pages of I Have, Who Has? game cards. Randomly distribute **ALL** of the cards. There are 24 cards. Some students may have more than 1 card. If there are not enough cards, partner students up so that at least all partners get 1 card. Begin with the 1st card that says



Students will read the card aloud. Each player must pay attention to his/her card to know when it is their turn. Continue to play until the last card is read. The last card says that it is the last card. While the pictures are in color, the cards will print clearly if printed in gray scale.

FORMATIVE ASSESSMENT QUESTIONS

- How did you know what fraction you had?
- Why was it important to listen carefully?
- Is it possible to show each fraction in a different way? Show me your fraction in a different way.
- How could you help a friend who thought  meant 1/3?

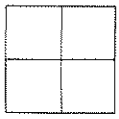
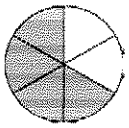
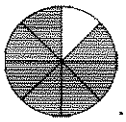
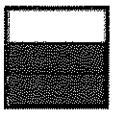
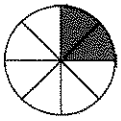
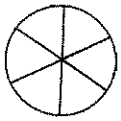
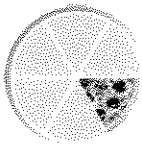
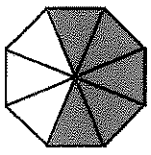
DIFFERENTIATION

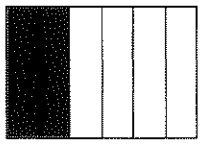
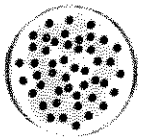
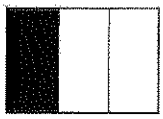
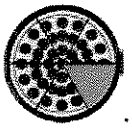
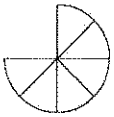
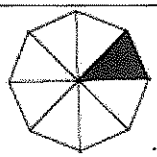
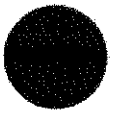
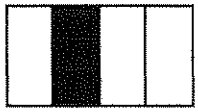
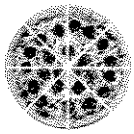
Extension

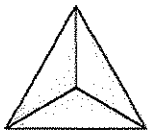
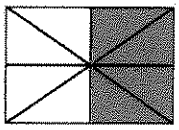
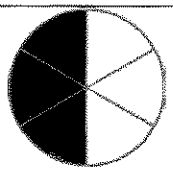
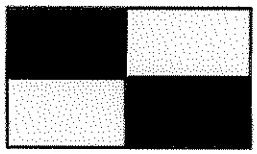
- Students may recreate the game with their own illustrations. They could also create a board game using fraction cards similar to these.

Intervention

- Students that struggle with fractions may need peer assistance during this game. Before beginning, give the student support by using questioning techniques to help them discover the fraction picture. They may need to write the fraction on the card or in their journal to help them remember the fraction as they play the game. It is possible to send a copy of this game home with the student to practice.

First Card: I have  Who has $\frac{3}{4}$?	I have  . Who has $\frac{4}{6}$?
I have  Who has $\frac{7}{8}$?	I have  . Who has $\frac{2}{3}$?
I have  Who has $\frac{2}{8}$?	I have  Who has $\frac{3}{8}$?
I have  Who has $\frac{6}{6}$?	I have  Who has $\frac{1}{6}$?
I have  . Who has $\frac{5}{8}$?	I have  Who has $\frac{2}{6}$?

I have  $\frac{4}{4}$ Who has $\frac{4}{4}$?	I have  $\frac{1}{1}$ Who has $\frac{1}{1}$?
I have  $\frac{1}{3}$ Who has $\frac{1}{3}$?	I have  $\frac{5}{6}$ Who has $\frac{5}{6}$?
I have  $\frac{6}{8}$ Who has $\frac{6}{8}$?	I have  $\frac{1}{8}$ Who has $\frac{1}{8}$?
I have  $\frac{2}{2}$ Who has $\frac{2}{2}$?	I have  $\frac{1}{4}$ Who has $\frac{1}{4}$?
I have  $\frac{8}{8}$ Who has $\frac{8}{8}$?	I have  $\frac{3}{3}$ Who has $\frac{3}{3}$?

I have  . Who has $\frac{4}{8}$?	I have  Who has $\frac{3}{6}$?
I have  Who has $\frac{2}{4}$?	I have  Who has $\frac{1}{2}$? This is the last card.

SCAFFOLDING/CONSTRUCTING TASK: MEASURING MY SHAPES

STANDARDS FOR MATHEMATICAL CONTENT

MCC3.MD.4 Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units— whole numbers, halves, or quarters.

STANDARDS FOR MATHEMATICAL PRACTICES

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

BACKGROUND KNOWLEDGE

Students in second grade will have had some experience with rulers and measuring inch and ½ inch. Later in 3rd grade, students will also learn to use the ruler to measure ¼ inch. In this activity, student will use rulers to measure each side of the shapes. After recording their information, students will make a line plot with the data collected.

ESSENTIAL QUESTIONS

- How do I use a ruler to measure length?
- How might I begin at any number on ruler to measure length?
- Explain how a line plot is made.

MATERIALS

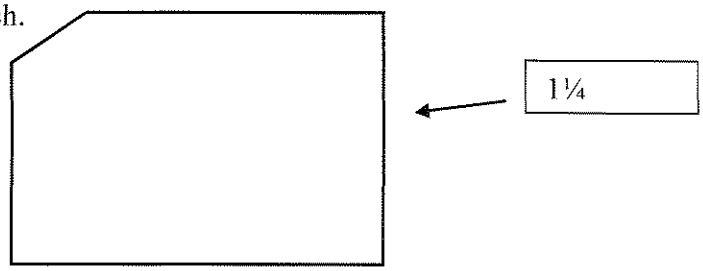
- Student Recording Sheet
- Rulers
- Plain Paper or Math Journal to make Line Plot

GROUPING

Partner or Individual

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION

Students will use rulers to measure each side of the shapes on the Student Recording Sheet. All measurements are to the nearest inch or ½ inch except for the pentagon shape below. The right side is 1 ¼ inch. This is good opportunity to preview Unit 7 with measuring to the nearest quarter inch.



There are 3 different types of rulers that can be printed from http://www.eduplace.com/math/mthexp/g3/visual/pdf/vs_g3_144.pdf. Print on stock paper and laminate to make sturdier.

After students record the measurements, you may wish to have them record the data in a chart. Students should also use the data to make a line plot, where the horizontal scale is marked off in appropriate units— whole numbers, halves, or quarters. At this point, students should be able to mark the whole numbers and halves as a review from second grade. You may wish to allow students to help construct a line plot together and add the quarter for the pentagon measurement. For more information about line plots, see the instructional strategies at the beginning of this unit or see page 333 in the Van de Walle resource book.

FORMATIVE ASSESSMENTS QUESTIONS

- How would you measure the shapes if you had a broken ruler?
- How would you explain to your parents/friends how you obtained your data?
- Explain why you made the line plot.

DIFFERENTIATION

Extension

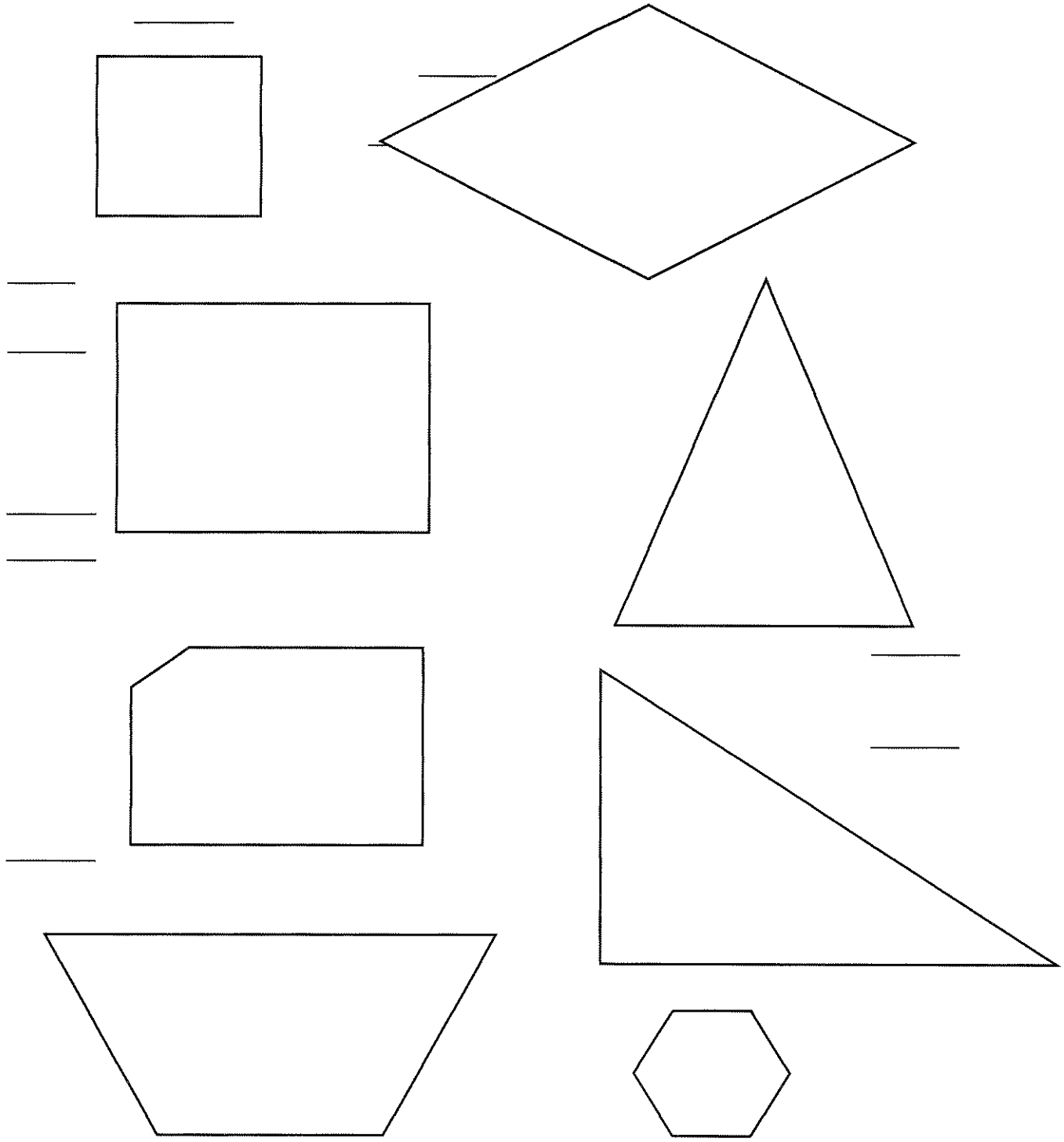
- You may want students to measure different shapes around the room, record the data, and make a line plot based on the shapes in your classroom.

Intervention

- Students who struggle may not be lining up the ruler correctly. They may also not know where halves are on a commercially produced ruler. You may want to print out the rulers provided above or use a paint marker/permanent marker to show halves on the ruler. Again, you can use this suggestion when you begin to teach quarters on the ruler.

Student Sheet

Directions: Using a ruler, measure each side of these shapes to the nearest inch, $\frac{1}{2}$ inch, or $\frac{1}{4}$ inch. Write your information on the lines along each side. Then, use the information to make a line plot.



CULMINATING TASK: CHOICE BOARD

STANDARDS FOR MATHEMATICAL CONTENT

MCC3.G.1. Understand that shapes in different categories (e.g., rhombuses, rectangles, and others) may share attributes (e.g., having four sides), and that the shared attributes can define a larger category (e.g., quadrilaterals). Recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories.

MCC3.G.2. Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole. *For example, partition a shape into 4 parts with equal area, and describe the area of each part as 1/4 of the area of the shape.*

MCC3.MD. 3 Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs. *For example, draw a bar graph in which each square in the bar graph might represent 5 pets.*

MCC3.MD.4 Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units— whole numbers, halves, or quarters.

STANDARDS FOR MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

BACKGROUND KNOWLEDGE

Throughout this unit, students have reasoned with shapes and their attributes, including learning about quadrilaterals and partitioning all shapes into equal areas. Students have also had the chance to represent and interpret data through scaled picture and bar graphs. They should have also generated measurement data and displayed the data on a line plot. Since this is the performance task for the unit, students should be able to show what they know from this unit.

ESSENTIAL QUESTIONS

- What do know about a quadrilateral that you didn't know at the beginning of this unit?
- How can you show what you have learned about quadrilaterals and other shapes?
- How would you explain to a younger student about the different shapes and how some shapes can share attributes?

- Can all shapes be split into halves, thirds, fourths, sixths and eighths? Prove it.

MATERIALS

- Choice Board Activity Sheet
- Rubric

GROUPING

Individual/ Group/Partner

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION

Students will be given the Choice Board Activity sheet and the Rubric for the Choice Board Activity. Read each of the activities with the students and discuss the rubric that students will be scored with. In order to show master of the standards that are presented in this unit, students should complete at least one activity with each letter. Activity A will show standard MCC3.G.1. Activity B will show standard MCC3.G.2. Activity C will show standards MCC3.MD.3 and MCC3.MD.4 Allow students several days (make a deadline within your class) to create, finalize, and present their activity from the Choice Board Activity Sheet. Assist students during the creation stage.

FORMATIVE ASSESSMENT QUESTIONS

- How will you show your classmates what you have learned through this unit?
- Is there something that still confuses you about shapes, data, or measurement?
- Would you rather work with a partner for this task? How will you make sure you both are represented through the final project?

DIFFERENTATION

Extension

- Students that need the extension may wish to do more than one or two of the activities. Students could be given time outside the classroom to work on additional activities.

Intervention

- Students may need assistance with many of the activities. Support these students by allowing them to work with a partner or providing additional support.

Geometry Choice Board

Student Directions: Show what you have learned from this unit. Pick one activity with an **A**, one activity with a **B**, and one activity with a **C** from the following activities to demonstrate to your classmates what you have learned.

A Pretend you are square. Write a letter to another quadrilateral (rectangle, rhombus, or parallelogram) telling her/him why you should be a part of his/her class. List specific likenesses/differences.	**A** Design a power point presentation on Quadrilaterals. Use at least five vocabulary terms in your power point that you have learned through this unit. Include the definitions and pictures.	**B** Make a poster that shows shapes partitioned into equal areas of half, thirds, fourths, sixths, and eighths. Remember to show a variety of shapes and show the same shape partitioned in several ways.
C Draw 5 shapes onto a piece of paper. Walk around your classroom or school for 10 minutes. Tally each shape that was seen. Create a bar graph or picture graph with this data. Remember to use a scale other than one to represent your data.	**A/B** Design a bulletin board idea for our classroom. Show examples of posters, worksheets, or projects from this unit that should be shown. Be sure to include examples for MCC3.G.1 and MCC3.G.2 Turn in an example mini sheet of what the bulletin board would look like.	**A** Find a website or game online that gives information about quadrilaterals. Give a small presentation explaining what you can learn about quadrilaterals from the website.
A/B Create a game for all of the shapes learned. Also include partitioning of the shapes in the game. Think of the cards needed, pieces and game board you want to use. Attach written instructions for how to play.	**C** Find 15 items around the room and measure them to the nearest inch or ½ inch. Make a table and create a line plot showing your data.	**C** Survey your class and another class about their favorite shape. Display the information using a bar graph and a picture graph. Remember to use a scale other than one to represent the data.

Rubric for Choice Board Activity

CATEGORY	**Outstanding**	**Good**	**Fair**	**Poor**
Content	Presentation content is engaging and interesting and appropriate for the intended audience.	Presentation content contains interesting information, but has limited appropriateness for the audience.	Presentation content has relevance, but is not appropriate for the audience.	Content is not relevant and does not focus on learning assessment.
Preparation	The presenter is well prepared with all necessary materials. Includes more than one activity for A, B, and C.	Most of the necessary materials are readily available. Includes at least one activity for A, B, and C.	Some of the necessary materials are unavailable or cannot be located. Includes only 2 activities.	The presenter displays a lack of preparation and lacks necessary materials. Only includes 1 activity for A, B or C.
Presentation	Presentation is engaging and easily understood and clearly stated for the audience.	Presentation is understood, but offers limited engagement of the audience.	Presentation has value, but is not engaging for the audience.	Presentation is not engaging and does not offer worthwhile information for the audience.
Relevance	Presentation demonstrates a clear connection to the student and his/her success in math.	Presentation is relevant, but no support is given for "why" the assessment is relevant to success in math.	Presentation has little relevance to the child's success in math.	Presentation is not relevant to the child's success in math.
Impact	This presentation will have a significant impact on my students' success in math.	This presentation will have a positive impact on my students' success in math.	This presentation will have a minor impact on my students' success in math.	This presentation will have no impact on my students' success in math.

Rubric

Rubric for Vocabulary Words

Name: _____ Date: _____

Indicator	3	2	1
Words Identified	Identified more than 5 words.	Identified 3 or 4 words.	Identified less than 3 words.
Definitions	Definitions were detailed and accurately matched the meaning of the word.	Definitions accurately matched the meaning of the word.	Most definitions accurately matched the meaning of the word.
Facts and Characteristics	Facts and Characteristics were detailed and accurately matched the meaning of the word.	Facts and Characteristics accurately matched the meaning of the word.	Most facts and characteristics accurately matched the meaning of the word.
Example and Non-examples	Example and Non-examples were detailed and accurately matched the meaning of the word.	Example and Non-examples accurately matched the meaning of the word.	Most accurately matched the meaning of the word.
Appearance	Responses were neatly written and easy to read.	Responses were fairly neatly written and readable.	Responses were not neatly written and difficult to read.

Rubric for Vocabulary Words

Name: _____ Date: _____

Indicator	3	2	1
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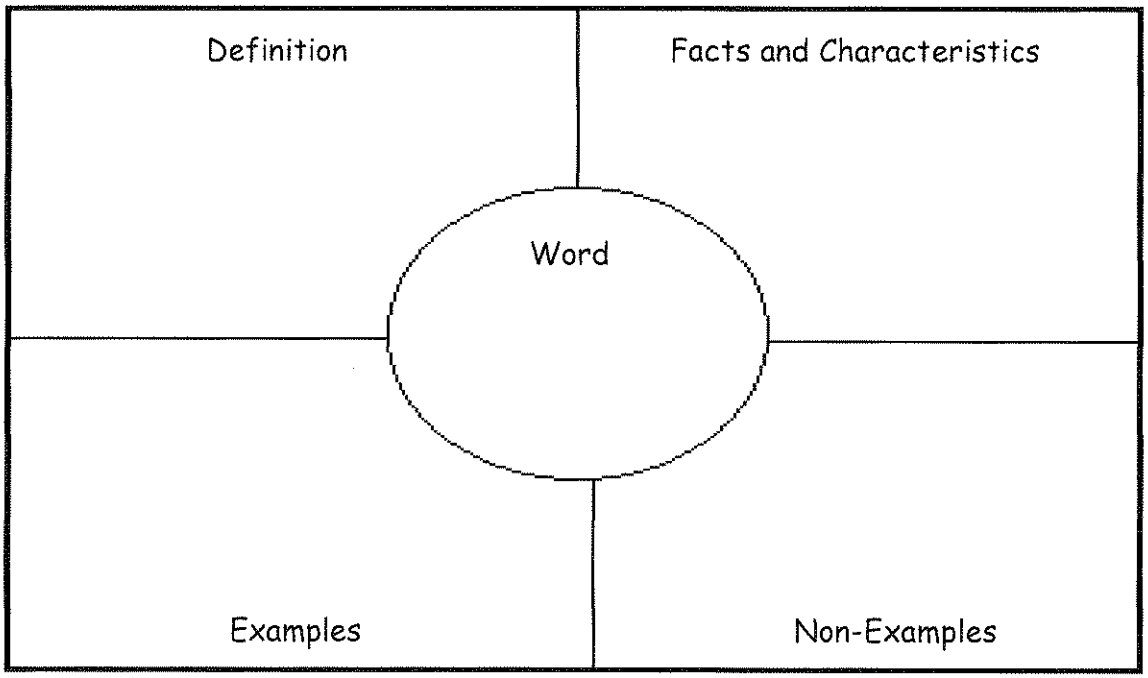
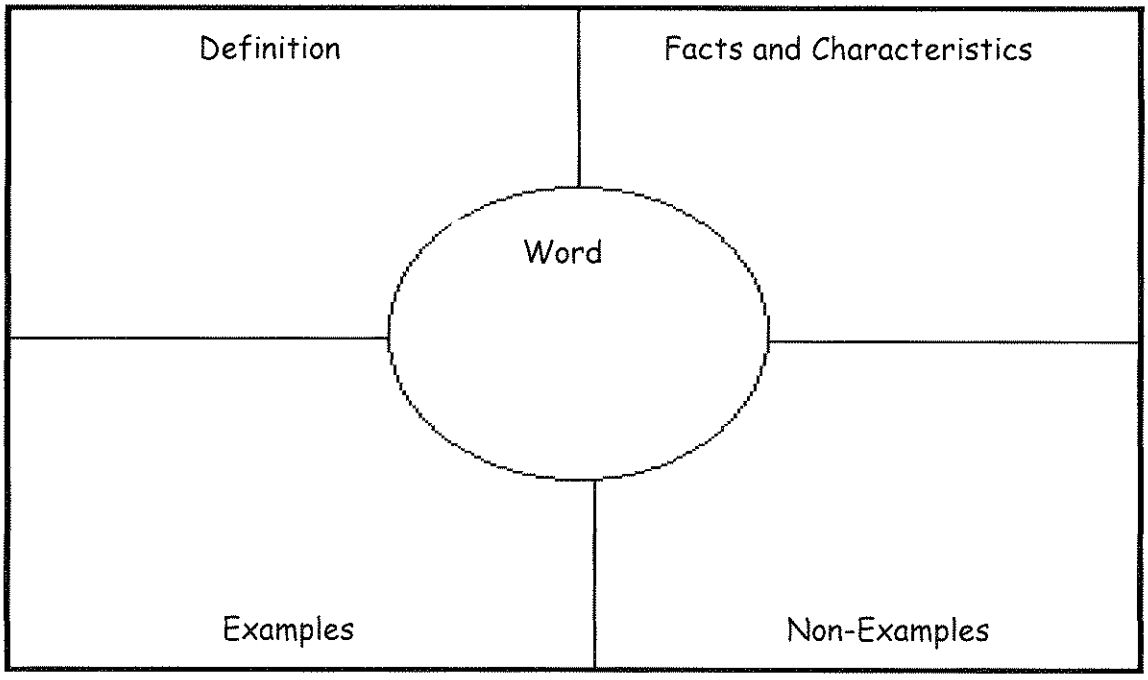
Appearance	Responses were neatly written and easy to read.	Responses were fairly neatly written and readable.	Responses were not neatly written and difficult to read.

Rubric





Geometry - Unit 5

Read Alouds

Grandfather Tang's Story
Ann Tompert

Greedy Triangle Marilyn Burns

A Fly on the Ceiling - Julie Glass

A Cloak for the Dreamer
Aileen Friedman

CONSTRUCTING TASK: PATTERN BLOCK GRAPHING

Images used from http://www.kellyskindergarten.com/math/math_activities.htm

STANDARDS FOR MATHEMATICAL CONTENT

MCC3.MD.3 Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs. *For example, draw a bar graph in which each square in the bar graph might represent 5 pets.*

STANDARDS FOR MATHEMATICAL PRACTICES

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

BACKGROUND

Throughout each unit, students should continue to develop their understanding of collecting and representing data. In this task, students will use pattern blocks to create pictures and then collect data from their picture. Afterwards, they will represent this data in a picture and bar graph.

ESSENTIAL QUESTIONS

- In what ways can I represent data from a picture?
- How can I show what materials were used to create a picture?
- What type of intervals can be used in a picture or bar graph?

MATERIALS

- Pattern Block Pictures
- Isometric paper to represent their picture once created http://www.ablongman.com/vandewalleseries/Vol_1_BLM_PDFs/BLM30-36.pdf (page 5)

GROUPING

Individual or Partner

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION

Students will use the pattern block pictures to recreate a picture. You may use these examples or pattern block puzzles available from numerous resources including pattern books and the internet. This activity will help students to continue to develop their spatial sense. Students will not be able to use the picture to recreate the pattern block picture because it is not to scale. If you have students that need the pictures to scale, please visit http://www.kellyskindergarten.com/math/math_activities.htm to locate the pictures.

Once students create the pictures, they will use that information to create a scaled bar graph and picture graph to represent their data. Have students create questions that classmates can answer about their data. For example, how many more rhombi are used than triangles? Are there more hexagons or small rhombi used in my graph? Allow students time to analyze and interpret the data of their classmates.

FORMATIVE ASSESSMENT QUESTIONS

- Did you find it difficult to recreate the picture?
- Why did you decide to use ___ (2, 5, or 10) as the scale for your graphs? Was that your first choice? Was there a better number to use?
- Were classmates able to analyze and interpret your data?

DIFFERENTIATION

Extensions

- Students may want to create their own pictures with the pattern blocks.

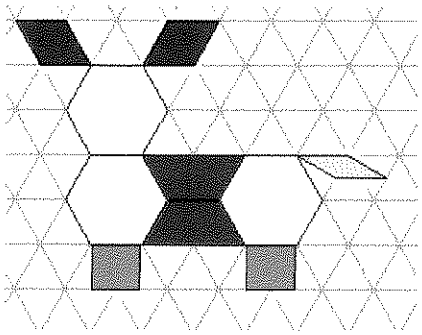
Interventions

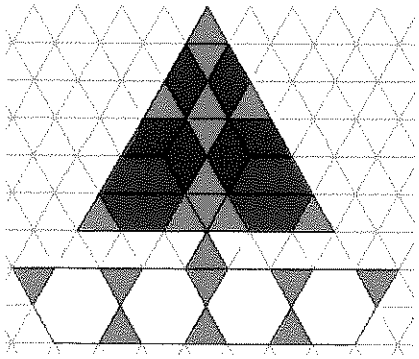
- Students might struggle with this activity for several reasons. If a student struggles with recreating one of the pattern block pictures, print out the picture from http://www.kellyskindergarten.com/math/math_activities.htm. If the student struggles with assigning a scale, have students make a tally chart to show how many of each shape. Based on that information, a student can usually see a number that would be good to use. While five is a good benchmark, students should experience different intervals. For students that struggle, 2 is a better scale interval to show ½ of a number.

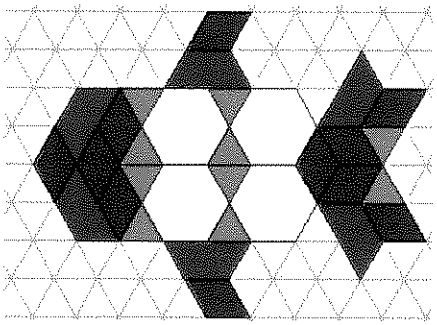
TECHNOLOGY CONNECTIONS

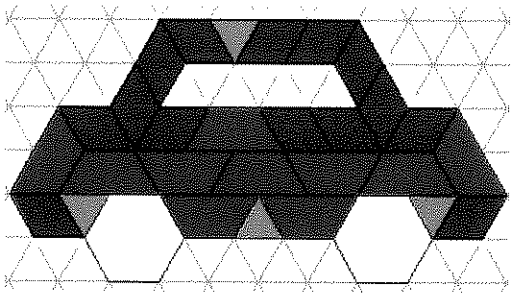
- http://nces.ed.gov/nceskids/createagraph/ - Create a bar graph online.
- http://www.softschools.com/math/data_analysis/pictograph/make_your_own_pictograph/ Create a Picture Graph

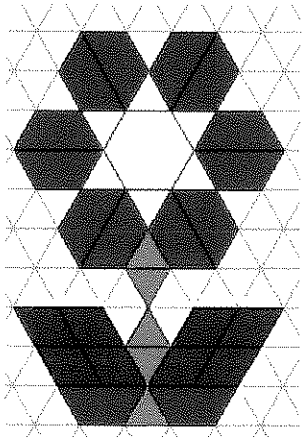
Samples of Pattern Block Pictures

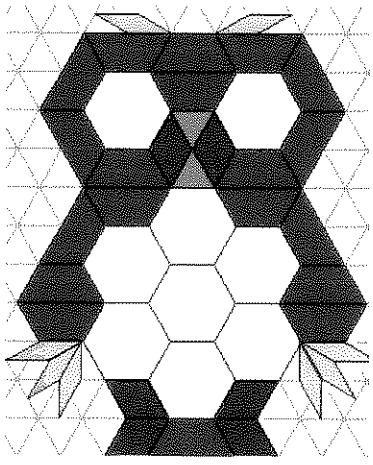












Name _____ Date _____

Pattern Block Picture Data

Use your pattern block picture to fill in the picture graph. Remember to complete the key. Use a scale interval of 2, 5, or 10. Make sure you think about your scale before beginning to complete your graph.

Title: _____	
Hexagon	
Rhombus	
Trapezoid	
Square	
Small Rhombus	
Triangle	
Key  = _____ Pattern Blocks	

Cut apart and Use these pictures in your picture graph